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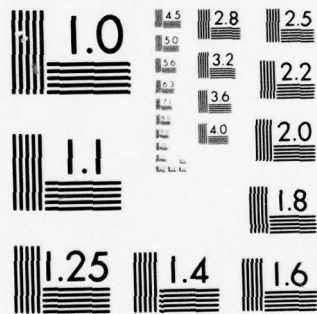
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VESSEL TRAFFIC DATA

LONG ISLAND SOUND

MAY 1976

FINAL REPORT

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11. Abstract This report presents data concerning vessel traffic in the Long Island Sound area. The data was obtained from films of a radar PPI at two sites in Long Island Sound. Also, tapes of communications activity on Channel 13 of the VHF/FM Maritime Mobile Band provided data. Data analysis obtained the following: Vessel Density; Vessel Route Identification; Vessel Speed; Close Encounter; Message Activity; Channel Utilization; and Channel Efficiency.		10. Type of Report and Period Covered Final Report February 1976 - May 1976
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SILVER SPRING, MARYLAND

VESSEL TRAFFIC DATA

LONG ISLAND SOUND

FINAL REPORT

L.BUHLER, J.GEIGER, T.NIGHTENGALE, P.WALCOTT

MAY 1976

**PREPARED UNDER CONTRACT DOT-CG-31446-A, TASK 14
FOR DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD
OFFICE OF RESEARCH AND DEVELOPMENT
WASHINGTON, D.C. 20590**

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The authors wish to acknowledge the contribution to the data analysis effort made by the U. S. Coast Guard R&D Center. Early in the effort it was discovered that to obtain significant amounts of communications data would require a considerable amount of time in terms of man-hours. Presented with this problem, the R&D center, in notably minimum time, developed an automated system for extracting data from communications tapes. With this system, the cost of obtaining communications data was significantly reduced. Finally, a comment on the radar films and communications tapes is in order. The films and tapes provided by the R&D center were consistently high quality, thereby easing the problem of data extraction.

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EXECUTIVE SUMMARY

This report is a final report in accordance with Contract DOT-CG-31446-A, Task 14, "VTS Statistical Data Analysis." As per the above contract, this report constitutes the seventh in a series of final reports for selected port areas in the United States.

In the report, data concerning vessel traffic in the Long Island Sound area are presented. The data were obtained using the USCG Data Collection Van at two sites in the area. The Data Collection Van is equipped with a radar to monitor vessel movements and a communications receiver to monitor communications activity. Specific data contained in the report is as follows:

RADAR

- Vessel Density - A count of the vessels present at a particular time for the data collection radar site. The count is made at regular time intervals. The data is presented in the form of a histogram. Also, vessels are classified as being small, large, at anchor, or tug with tow according to the size and behavior of the radar return.
- Vessel Route Identification - A chart depicting the routes used by vessels transiting the area.
- Vessel Speed - A histogram and table of vessel speeds observed at the radar site and tabulations of associated data.
- Close Encounter - A count of vessel encounters and close encounters observed, using close encounter criteria derived in this report.

COMMUNICATIONS

- Communications Channel Message Activity - A count of the number of messages transmitted on channel 13 of the VHF/FM Maritime Mobile Band, as a function of time. The data is presented in the form of a histogram with message counts totaled in fifteen-minute intervals over a 24-hour period.
- Communications Channel Utilization - The percentage of time that squelch is broken on channel 13. Utilization is computed for fifteen-minute intervals over a 24-hour period so that the variation in utilization with time of day can be observed.
- Communications Channel Efficiency - A count of the number of valid and invalid messages on channel 13 of the VHF/FM Maritime Mobile Band. Valid messages are those judged to be conforming to the Bridge-to-Bridge Radiotelephone Act. Counts are totaled within fifteen-minute intervals and a histogram of the ratio of valid messages to total messages is given. The abscissa of the histogram is time of day.

The vessel traffic data presented in the report was obtained by analyzing motion pictures of a radar PPI display. Communications data was collected by monitoring tape recordings of the communications activity on channel 13. The radar films and communications tapes were obtained by the U.S. Coast Guard Data Collection Van. In Long Island Sound, the van was stationed at Eatons Neck Point and Avery Point.

The data obtained for these sites are given in detail in Section II of this report.

General Observations on Long Island Sound

Reviewing all the data on Long Island Sound provided in Section II, certain conclusions and observations can be made. They are as follows:

1. Vessel Density

- The highest single vessel density count of the two sites was 13 ships at Avery Point.
- A peak traffic period is defined as a time interval during which vessel density is greater than or equal to 50% of the peak value for the site, and is sustained for more than fifteen minutes.

The following observations can be made based on the vessel density data collected.

- Eatons Neck Point - During the eight day coverage, three of the five peak periods occurred on Thursday. The longest sustained peak period lasted 2½ hours on Tuesday. A peak period occurred from 1215-1315 on both Tuesday and Thursday. Two daily patterns in traffic density were observed. The first shows large vessels and tugs with tows predominant from 0000-0800 hours and 1600-2400 hours; with small vessels predominant between 0800-1600 hours. The second daily pattern is the tendency for vessel density to heighten between 1000-1400 hours.
- Avery Point - Four peak periods were observed during the eight day coverage, two of these were on Tuesday. All peak periods occurred within the time period of 1315-1700 hours. One three hour peak period from 1330-1630 hours on Saturday had the greatest duration. The only daily pattern that was evident was a tendency for vessel density to heighten between the hours of 0900-1500.

More detailed information concerning vessel density is given in Section 1.3 of this report.

2. Route Identification

Vessel traffic patterns observed at each site on Long Island Sound were the following:

- Eatons Neck Point's traffic patterns were of two kinds. The first was generally an East to West non-stop flow of large vessels along Long Island Sound, and the other was predominately a North to South flow of small boat traffic into and out of Huntington Bay.
- Avery Point's route identification shows two dominant routes. The first route was from Long Island Sound to New London Harbor. The second route was from Block Island Sound to Long Island Sound. Small vessels were observed only within 6 nautical miles of the radar van, with 50% of the small vessels heading into New London Harbor. Within the site, 10 vessels went in an easterly direction, 13 vessels in a westerly direction, 4 vessels in a northerly direction and 3 vessels in a southerly direction.

More detailed information concerning the types of vessels, predominant direction of advance and route breakdowns are given in Section 1.3 of this report.

3. Vessel Speed

Observed speeds on Long Island Sound had the following ranges:

- Eatons Neck Point 4-14 knots (8.6 knot average)
- Avery Point 5-20 knots (12.2 knot average)

More detailed information concerning vessel speeds according to types of vessels is given in Section 1.3 of this report.

4. Close Encounters

The observed rates of close encounters are as follows:

- Eatons Neck Point - 21 in 48 hours (.44)
Avery Point - 23 in 24 hours (.96)

The numbers in parenthesis are close encounters per hour.

In observing close encounters, account was taken of encounters which were not "close." That is, an encounter was described as a close encounter if the distance between two vessels was below a certain threshold value. This threshold value varies from site to site as a function of the radar range scale per site. The values are: Eatons Neck Point - 300 yards; Avery Point - 400 yards. The relationship between encounters and close encounters was as follows:

- Eatons Neck Point - 21 close encounters
out of 52 total encounters 40%
- Avery Point - 23 close encounters
out of 49 total encounters 47%

Here, the numbers in parenthesis represent the percentage of close to total encounters. More detailed information regarding close encounters is given in section 1.3 of this report.

5. Message Activity

Message activity exhibited the following peak and average values for channel 13:

<u>Site</u>	<u>Day of Coverage</u>	<u>Peak No. of Messages</u>	<u>Time of Peak</u>	<u>Average No. of Messages</u>
Eatons Neck Point	Thursday, 17 April 1975	230	0610 - 0615	115
Avery Point	Thursday, 1 May 1975	510	0610 - 0615	49

6. Channel Utilization

Channel 13 utilization exhibited the following peak and average percentages:

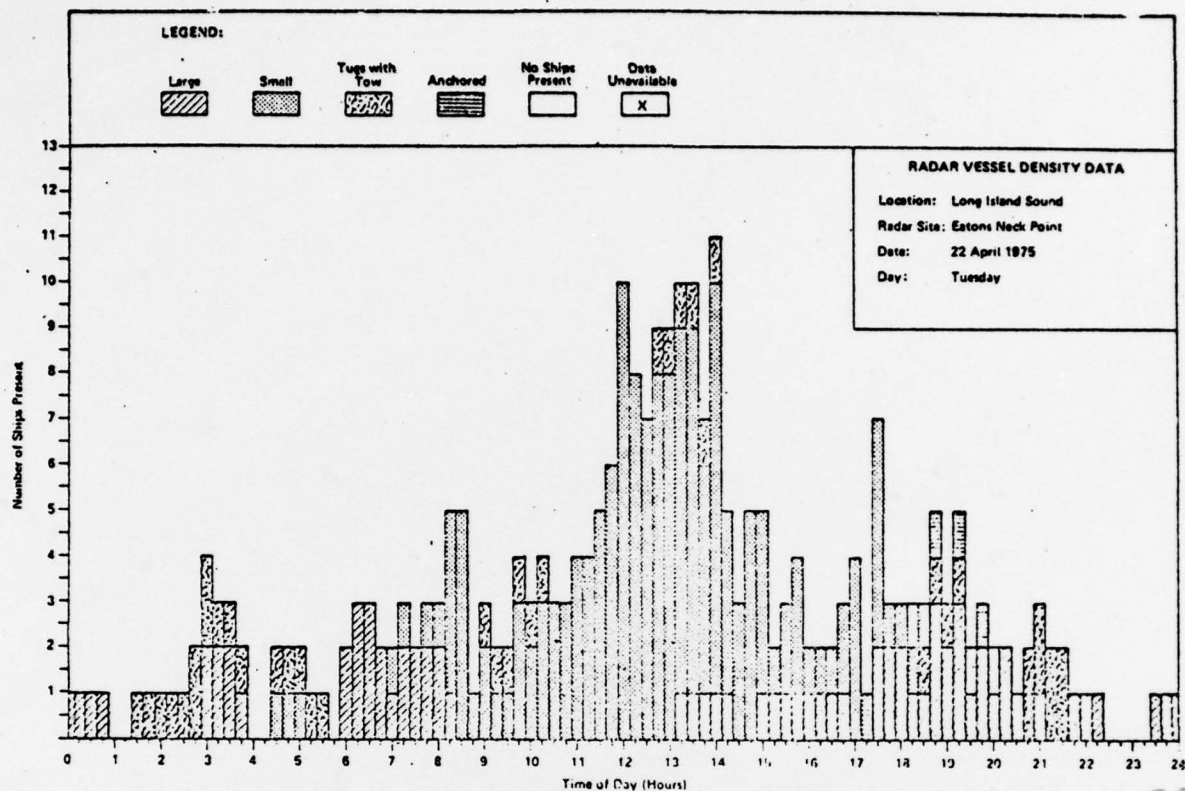
<u>Site</u>	<u>Day of Coverage</u>	<u>Peak %</u>	<u>Time of Peak</u>	<u>Average %</u>
Eatons Neck Point	Thursday, 17 April 1975	22	0145 - 0200	15
Avery Point	Thursday, 1 May 1975	16	1430 - 1445	4

7. Channel Efficiency

Channel efficiency data are as follows:

<u>Site</u>	<u>Peak (%)</u>	<u>Average (%)</u>
Eatons Neck Point	100	78
Avery Point	100	73

A sample of the form in which each of the various types of data is presented is given in Figure E-1.



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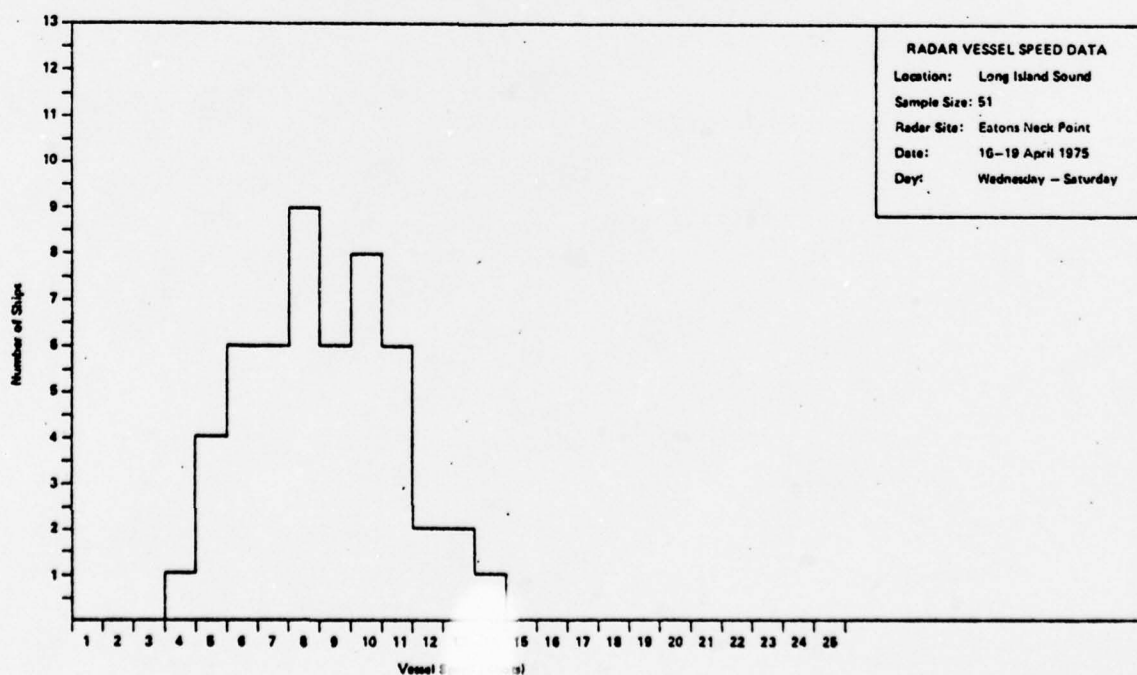


FIGURE E-1. SAMPLE DATA

CLOSE ENCOUNTER
FOR
EATONS NECK POINT

SPEED DATA
FOR
EATONS NECK POINT *

No.	Day	Time Hour/Minute	Distance Yards	Size	Manner of Approach*	Vessel No.	Vessel Size	Average Speed In Knots	Direction	Day	Time Hour/Minute
1	Friday 18 April 1975	19 50	<25	1 large, 1 small	C	1	tug with tow	8	NE	Wednesday 16 April 1975	10 29
2	Saturday 19 April 1975	03 16	300	1 tug, 1 large	P	2	large	6	NE		11 00
3	19 April 1975	08 29	<25	2 small	P	3	large	7	NE		12 54
4		08 42	300	1 tug, 1 large	P	4	large	9	NE		14 28
5		10 09	<25	2 small	O	5	large	8	NE		15 20
6		10 47	300	2 small	O	6	large	6	NE		15 37
7		11 06	<25	2 small	O	7	large	10	SW		17 21
8		11 23	<25	2 small	P	8	large	7	NE		17 27
9		11 24	<25	2 small	P	9	large	12	NE		17 38
10		11 30	<25	2 small	O	10	large	13	SW		17 51
11		11 35	300	2 small	P	11	large	10	NE		18 20
12	Saturday 19 April 1975	11 36	<25	2 small	P	12	large	14	SW		18 25
13	19 April 1975	11 50	<25	2 small	O	13	large	11	NE		18 59
14	Sunday 20 April 1975	02 51	<100	1 tug, 1 large	P	14	tug with tow	8	NE	Wednesday 16 April 1975	20 28
15	20 April 1975	03 50	300	1 tug, 1 large	P	15	large	8	SW		22 13
16		04 00	150	2 large	O	16	large	9	NE		22 41
17		12 14	<25	2 small	P	17	large	11	SW		23 01
18		12 15	<25	2 small	P	18	large	5	NE	Thursday 17 April 1975	00 02
19		12 22	<25	2 small	P	19	large	6	NE		01 03
20	Sunday 20 April 1975	12 30	<25	2 small	O	20	tug with tow	5	NE		01 25
21	20 April 1975	13 55	300	2 large	P	21	large	7	SW		02 41
22						22	large	9	SW		06 11
23						23	large	11	SW		06 44
24						24	large	8	SW		07 31
25						25	large	13	SW		08 37
26						26	tug with tow	5	SW	Thursday 17 April 1975	11 46
27						27	large	6	NE		12 02

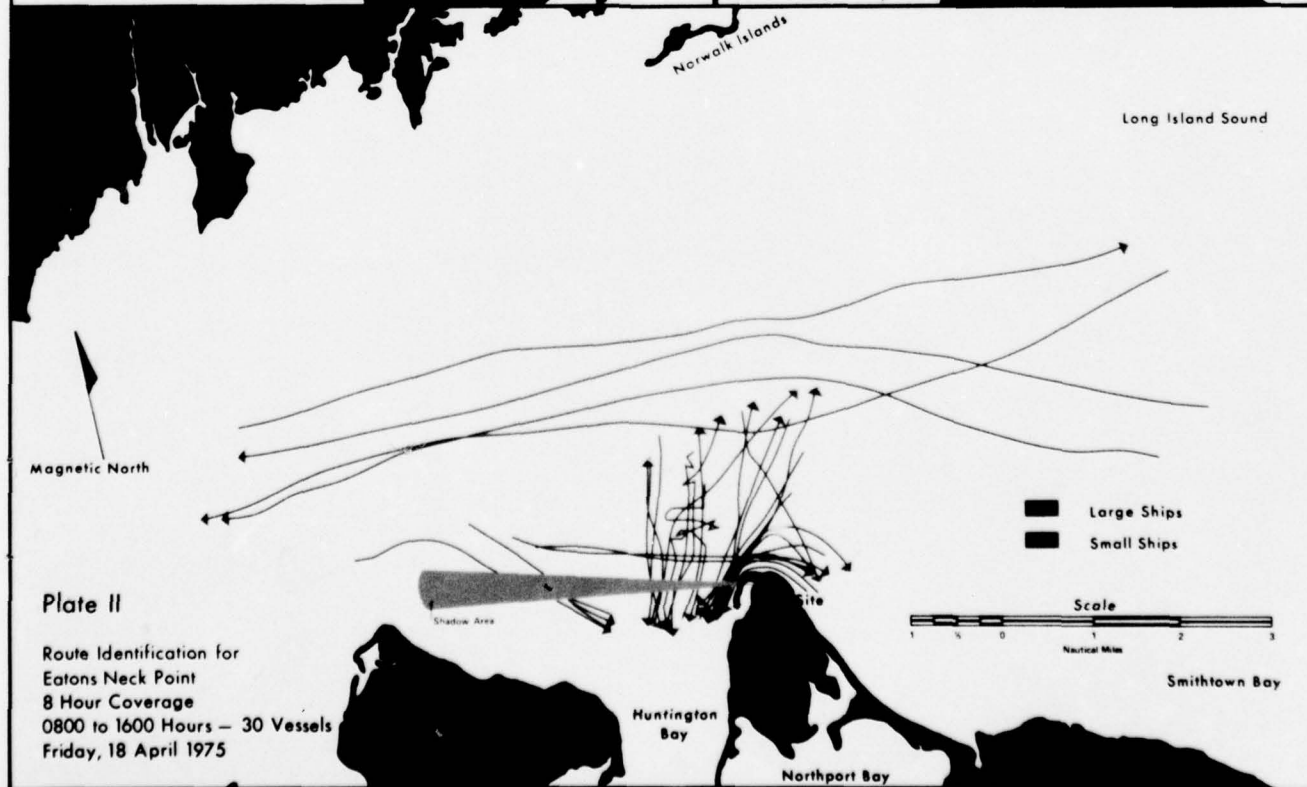
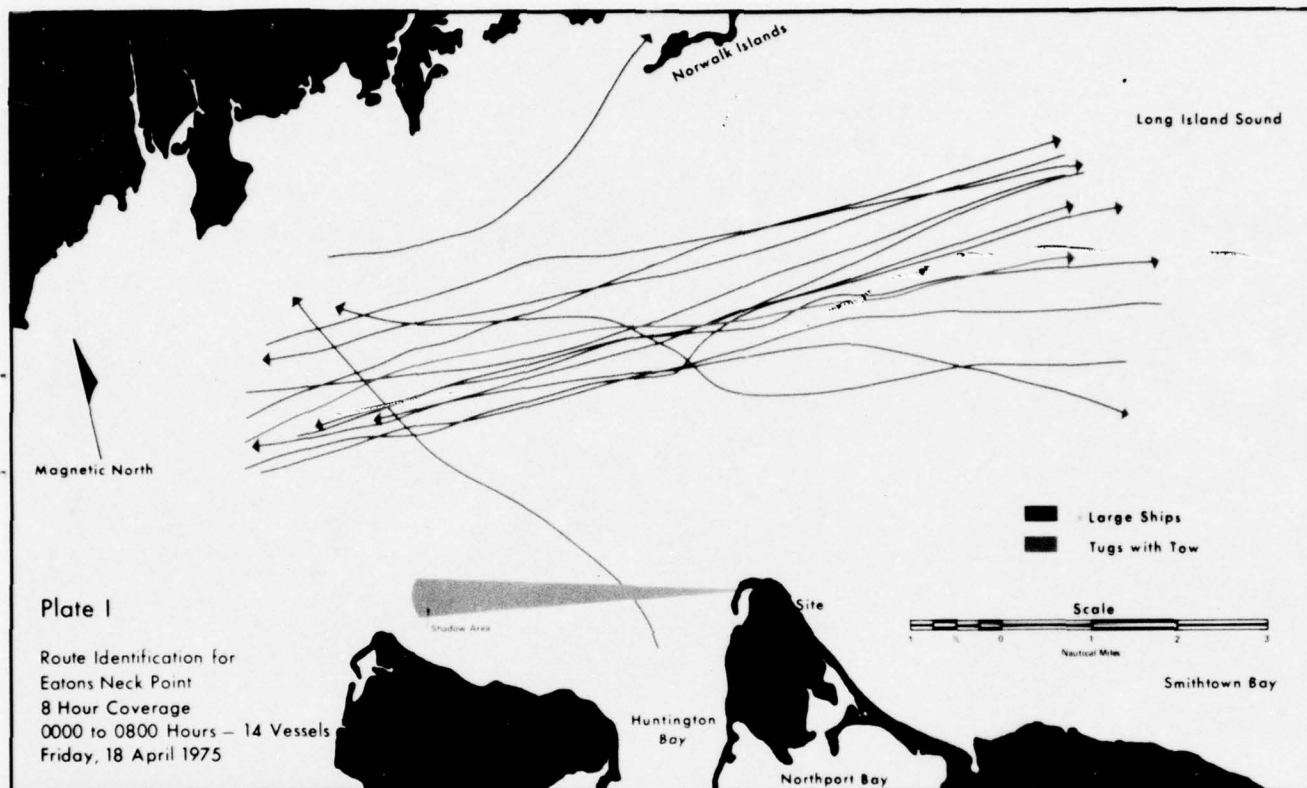
21 close encounters out of 52 encounters in 48 hours.

* Speed calculation of small ships was impossible here. Small ships are discernable at only a small locus of the site's total range (see route identification chart) and the sudden stopping and starting that typifies their behavior further constricts accurate speed measurements.

*P = Passing
O = Overtaking
C = Crossing
≤ = less than

FIGURE E-1. SAMPLE DATA (Cont.)

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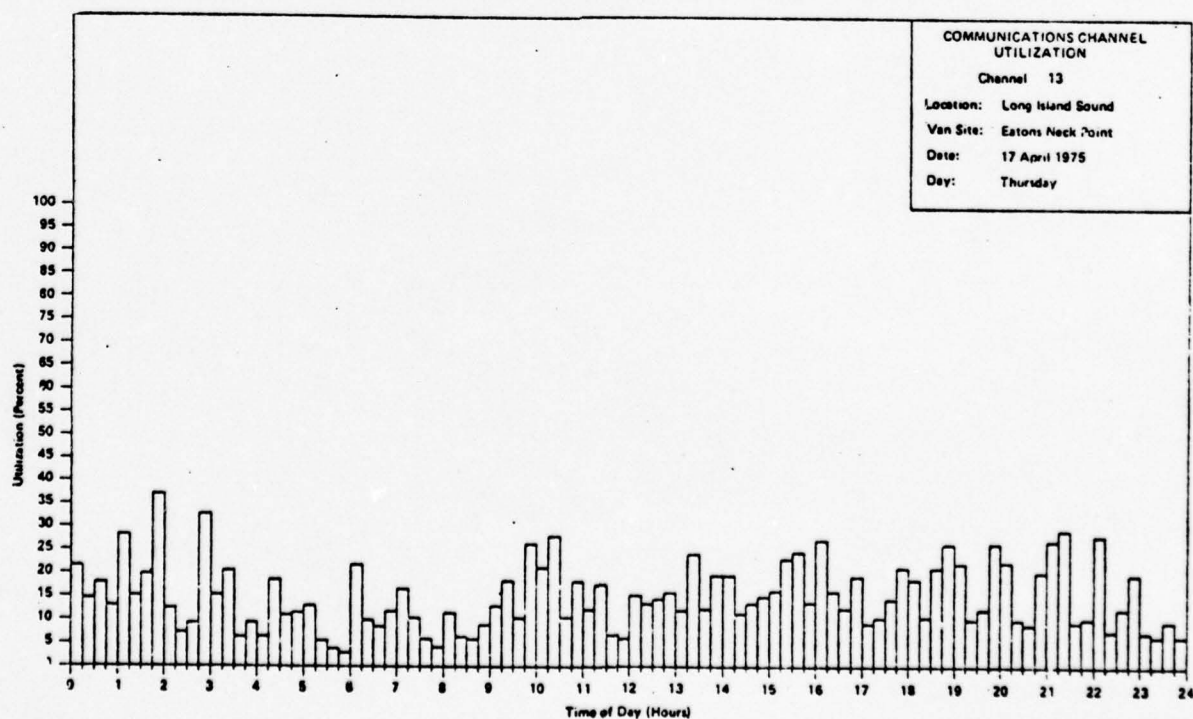
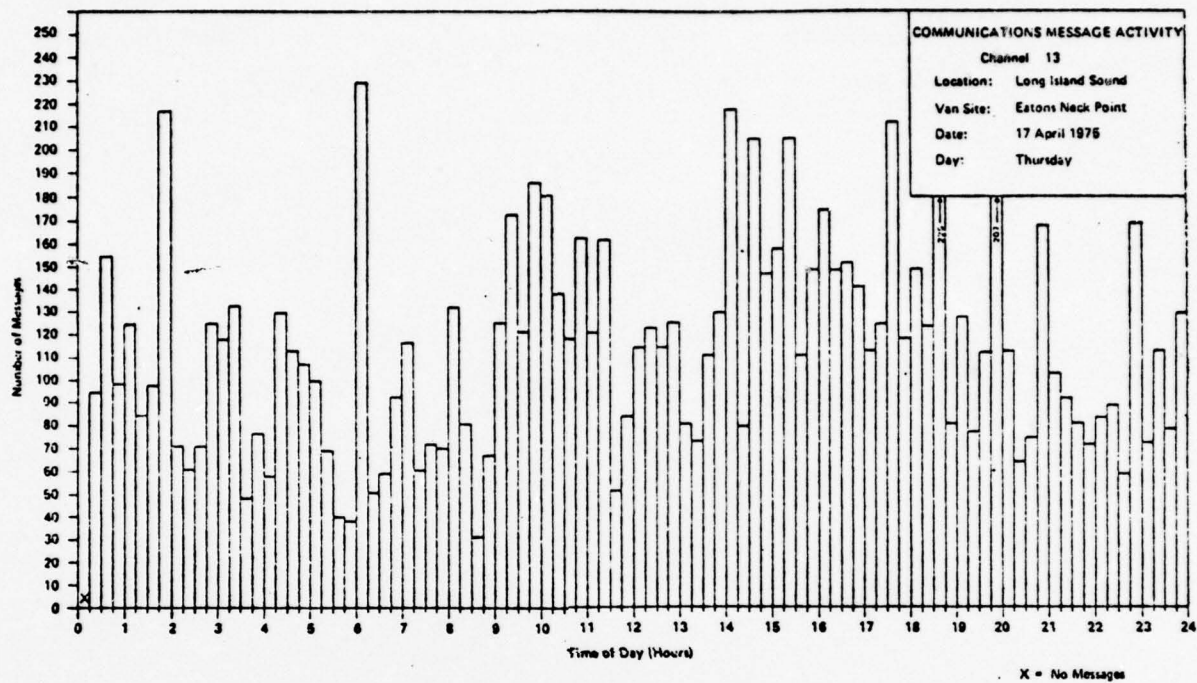


FIGURE E-1. SAMPLE DATA (Cont.)

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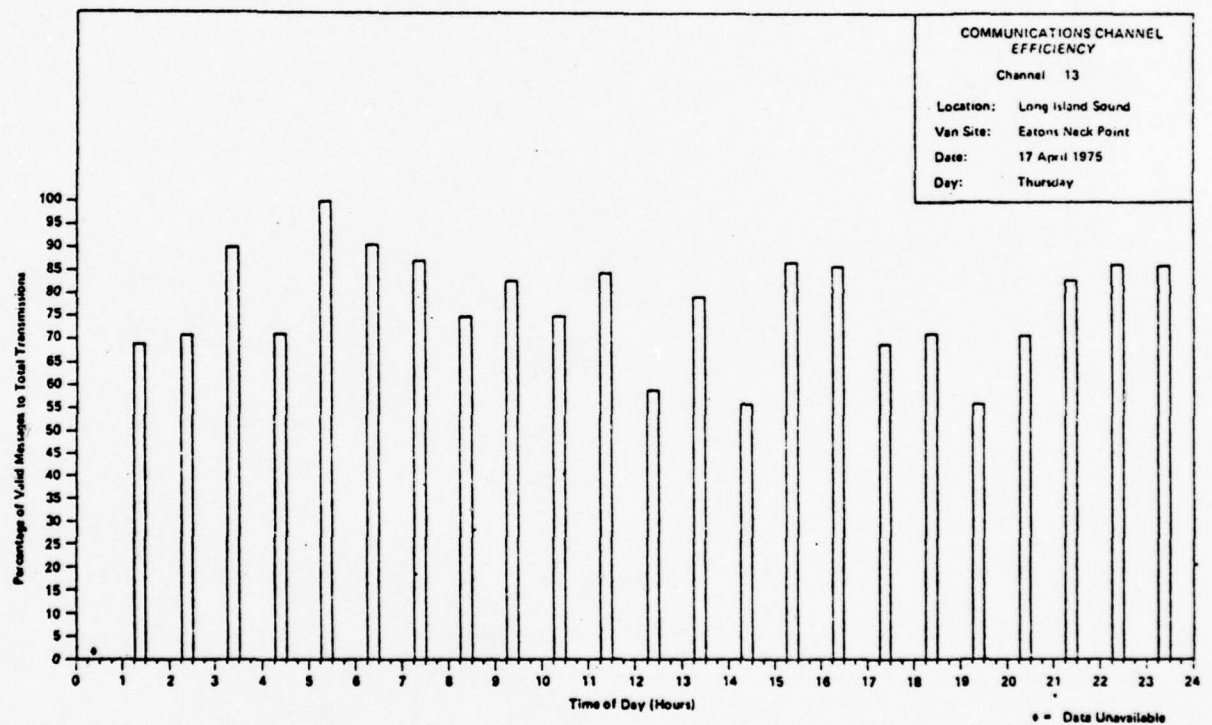


FIGURE E-1. SAMPLE DATA (Cont.)

I. DISCUSSION OF DATA

1.1 EATONS NECK POINT SITE

Eatons Neck Point sits on the northernmost tip of Eatons Neck peninsula. Below this peninsula is Northport Bay, while Huntington Bay lies to the west. Eatons Neck Point looks out onto the Long Island Sound. The radar van was placed at the immediate eastern side of the tower there, and was able to cover the Long Island Sound and the entrance to Huntington Bay. The equipment was set to a return radius of 6 nm.

To help isolate two distinct daily patterns in vessel behavior, the route identification chart was separated into plates I and II. The chart was developed from data taken on Friday, 18 April 1975. Plate I describes vessel movement 0000 to 0800 hours, when large ships and tugs with tow monopolize the scene. Thirteen large ships and one tug with tow are pictured. Of these, seven vessels headed east across Long Island Sound towards Connecticut, and five went west towards New York City. One ship is depicted leaving Huntington Bay travelling northwesterly for Stamford, and another cuts across Long Island Sound for the Norwalk Islands.

Plate II documents the period when small ships predominate, 0800-1600 hours. Here, small ships number 26 out of the 30 shown in the plate (an 87 percent vessel density for small ships). They tend to hover around Eatons Neck Point. No major directional pattern is discernable. Besides pleasure craft, which were not as predominant in April as they would become in warmer months, the mainstay of small boat traffic is the fishing boats. There is brisk commercial and pleasure fishing for lobsters and clams. The coastal areas of Northport and Huntington attest to this since their streets are often bordered with seafood restaurants and retail outlets.

An oil company operates a pipeline about 3 nm true east of Eatons Neck Point. Tankers come here on the average of one per week, but there is no set schedule to pinpoint the times of their arrival and departure. On the route identification diagram, a gap appears just west of the van location. This effect is caused by a boathouse situated to the left of the radar van as one looks out at the Long Island sound.

Vessel density at this site was generally low, it peaked at 11. The week's coverage was Wednesday thru Wednesday, 16-23 April, 1975. In this period, a total of five peak periods were observed, three of these occurred on Thursday, the two remaining were on Tuesday and Sunday. The overall tendency was for traffic to heighten between 1000 and 1400 hours.

Speed data was sampled from 51 large ships and tugs with tow. It was impossible to clock the speeds of small ships since (as the route identification chart shows) they appear only within a small locus at the site, and the sudden stopping and starting, typical of their behavior, constricts accurate speed measurement. The range in speed for the tugs with tow and large ships was 4-14 knots. Eighty-eight percent of the speeds fell in the 5-11 knot range however. The overall average speed was 8.6 knots; large ships alone averaged 8.9 knots and tugs with tow, 7.5.

Fitting into the pattern of low vessel densities and low speeds, the rate of close encounter per hour was a mere 0.44; approximately two hours would pass on the average, before a close encounter occurred. Forty percent of all encounters were close encounters.

In the area of channel communications, message activity averaged 115 per 15 minute interval. At a glance, this appears in contradiction with the low vessel densities recorded, but we must bear in mind the mechanical method* used in tallying messages.

Channel utilization averaged 14.74 percent which is 2.25 minutes of messages per 15 - minute interval. Channel efficiency had an average of 78 percent.

Communications data for Eatons Neck Point was taken on Thursday, 17 April, 1975. In a correlation for the two, channel utilization and message activity showed a positive relationship for 67 percent of their intervals. The correlation of channel efficiency with message activity obtained a 61 percent value, where the relationship was positive. The numerical values of these correlations are not as dramatic as those derived for Avery Point. Here, they tend to be inconclusive since their values are not low enough to describe the simultaneous behavior of any pair as independent, or at the other extreme, the values were not high enough to substantiate strong positive relationships.

* Machine counting of each break in squelch as a message.

1.2 AVERY POINT SITE

Avery Point is the home of the U.S. Coast Guard Research and Development center. Because of its location vis-a-vis the Connecticut shoreline, it overlooks in a 180° sweep the waters of and land masses in the Long Island Sound. Avery Point is the southernmost tip of Groton, Connecticut. Immediately west of it is New London Harbor.

The radar van was positioned on a rocky elevation at the tip of the shore. There was no local hindrance to visibility. With the equipment adjusted to a 12 nm return radius, Plum Island to the southwest and the city of Avondale due east were just within the screen's scope.

Beyond the business of dredging New London Harbor and dumping the marine sand and soil deposits in the dumping grounds 2½ nm south of Avery Point, there is no other local industrial activity that directly affects vessel traffic. Even commercial fishing is not a developed activity here. The absence of these activities tells strongly on the level of vessel density at this site, as further discussion will show.

The body of water Avery Point overlooks is generally referred to as the Long Island Sound. Specifically however, the southernmost reach of the scope is Block Island Sound; north of Fishers Island lies the Fishers Island Sound; and west of that is Long Island Sound. The site covers three ferry routes, which are indicated in the route identification chart. On one route, a large ferry travels southwest to Orient Point just below Plum Island. The second is utilized by a small ferry which goes to Fishers Island. The third is the ferry route across Block Island Sound to Block Island, but due to Block Island's location outside the radar range, only a portion of the route is visible. Another route that is traversed with consistency is drawn by the movement of large ships which leave and re-enter New London Harbor, making the loop shown in the middle of the route identification chart. These vessels are the ones dredging New London Harbor and dumping the deposits in the dumping grounds.

The route identification chart was produced from an eight-hour sample, 0900-1700 hours Tuesday 6 May, 1975. One parameter introduced by the radar range here is that both small and large vessels appeared to have the same size return. But we were able to make the distinction in size since the truly small ships were invisible beyond a six-mile radius from the van location, while large ships remained visible throughout the whole range. The bulk of the area's traffic emanated from New London Harbor. East/west or thru traffic constituted 20 percent of traffic density, and consisted of two tugs and four large ships traversing Long Island Sound to locations along the Connecticut and adjacent New York coasts. The chart depicts an equal distribution of small and large ships, while tugs represented six percent of the vessels present. The weight of vessel traffic bears on the western portion of the site in the Long Island Sound.

Vessel density data was taken from 30 April - 7 May 1975, Wednesday to Wednesday. Vessel density peaked at 13 ships on Saturday. There was a paucity of peak periods, a total of four occurring in the week of coverage. While these occurred within the bracket of 1300-1700 hours, their scarcity does not lend to a conclusive statement on density trends. Ignoring these peak occurrences for a moment, the remaining densities are low with gentle and random fluctuations - to the extent that comments on cyclical behavior are obviated. The three ferry routes remain as predictable vessel behavior, while the dredging of New London Harbor, still continuing to date, is a more finite activity. Postulations on vessel density and behavior in the harbor itself are functions of the level of change in economic activity there, which the improved access may cause.

When addressing close encounter data to the low vessel densities at this site, the expected occurs. The close encounter rate is less than one per hour (0.96).

The average speed of the fifty vessels sampled is 12.2 knots. Their range was from 5 to 20 knots, and the mode was 13 knots.

Communications data were taken for Thursday 1 May, 1975. Channel utilization was low, it averaged 4.47 percent per 15 minute interval, or a little over half a minute of messages every 15 minutes. There was a positive relationship between channel utilization and message activity. In a correlation of the two, the relationship derived an 82 percent value, which means that for 82 percent of the intervals, the data moved in the same direction. Channel efficiency and message activity had a much lower degree of correlation. Their respective intervals showed similar simultaneous behavior for only 46 percent of the time. This indicates that a change in the number of messages sent did not attract a corresponding change in the communications efficiency. The data suggests that these two functions operate independently at this site. Independent also was the correlated behavior of channel efficiency and channel utilization. There was only a 29 percent proportional movement between the two and for 71 percent of the intervals, the two categories of data dispersed.

1.3 DETAILED DATA SUMMARY

The following observations can be made on the data collected for the two sites along Long Island Sound.

1. Vessel Density

- A peak traffic period is defined as a time interval during which vessel density is within 50% of the peak value for the site, and is sustained for more than 15 minutes. A lack of peak periods indicates relatively uniform traffic activity throughout the day.

Listed below are the peak periods observed at each site.

- Eatons Neck Point (for radar coverage of Wednesday through Wednesday, 16 - 23 April 1975, peak value = 11)

Wednesday	-	no peak periods
Thursday	-	1215-1315, 1515-1615, 1715-1830
Friday	-	no peak periods
Saturday	-	no peak periods
Sunday	-	0330-0415
Monday	-	no peak periods
Tuesday	-	1130-1400
Wednesday	-	no peak periods

- Avery Point (for radar coverage of Wednesday through Wednesday, 30 April - 7 May 1975, peak value = 13)

Wednesday	-	1400-1430
Thursday	-	no peak periods
Friday	-	no peak periods
Saturday	-	1330-1630
Sunday	-	no peak periods
Monday	-	no peak periods
Tuesday	-	1315-1345, 1615-1700
Wednesday	-	no peak periods

The following observations were made, based on the vessel density data collected:

- Eatons Neck Point - In the eight days covered, three of the five peak periods occurred on the same day, Thursday. The longest sustained peak period lasted 2½ hours on Tuesday. Traffic peaked at the same time, 1215-1315, on both Tuesday and Thursday. Two patterns in traffic density were observed. The first pattern shows large vessels and tugs with tows predominate from 0000-0800 hours and 1600-2400 hours; while small

vessels were predominant from 0800-1600 hours. The second pattern shows a tendency for vessel density to heighten between 1000-1400 hours. The highest density time for each full day of coverage, except Monday and Tuesday, occurred between the hours of 1115-1230. The most dense traffic period on Monday occurred from 0515-0530 and at 1615 hours; while on Tuesday, 1400 hours is the time of the high-density interval, with 1200, and 1315-1330 running a close second.

- Avery Point - During the eight-day coverage, two of the four peak periods were on Tuesday. All peak periods occurred within the time period of 1315-1700 hours. One three-hour peak period from 1330-1630 on Saturday had the greatest duration. The only pattern that was evident, was a tendency for vessel density to heighten between the hours of 0900-1500. Finally the highest density times for each full day of coverage, except Thursday, occurred between the hours of 1330-1630. Friday also had two other times of high density at 0745 and 1130 hours. The period of dense traffic on Thursday occurred at 1215 hours.

2. Route Identification

The following definitions will apply to all route identification charts: a tug with tow is the combination of a small vessel pushing or pulling another unit. Small and large ships are so defined in a comparative relationship.

The route identification charts referred to in Section II indicate the following:

- Eatons Neck Point (coverage 18 April 1975, Plate I 0000-0800, Plate II 0800-1600)

(Long Island Sound is abbreviated here as L.I. Sound)

Plate I (0000-0800)

<u>Type of Vessel</u>	<u>No. of Vessels Present</u>	<u>Route and Direction</u>
Small Ship	0	
Large Ship	6	L.I. Sound, Northeast
	5	L.I. Sound, Southwest
	1	L.I. Sound, towards Norwalk Islands, Northeast
	1	Huntington Bay towards Stamford, Northwest
Tug with Tow	1	L.I. Sound, Northeast
Total No. of Vessels	14	

Out of 14 total vessels present during this time coverage 8 headed northeast, 5 headed southwest, and one headed northwest. As evident from the preceding data, no small ships were present; and of the 14 vessels present all were large except one tug with tow. There was no dominant direction of vessel movement; but of the total vessels present 12 (80%) traveled solely along the Long Island Sound, as evident in the following data:

<u>Route</u>	<u>Northeast</u>	<u>Southwest</u>	<u>Northwest</u>
L.I. Sound	6 large 1 tug with tow	5 large	
L.I. Sound towards Norwalk Islands	1 large		
Huntington Bay towards Stamford			1 large

Plate II (0800-1600)

<u>Type of Vessel</u>	<u>No. of Vessels Present</u>	<u>Route and Direction</u>
Small Ship	2	L.I. Sound to Huntington Bay, Southeast
	1	L.I. Sound to Smithtown Bay, Southeast
	3	Huntington Bay towards Smithtown Bay, East
	1	Smithtown Bay to L.I. Sound, Northwest
	5	Smithtown Bay to Huntington Bay, West
	7	From Huntington Bay, North
	7	L.I. Sound to Huntington Bay, South
Large Ship	3	L.I. Sound, Southwest
	1	L.I. Sound, Northeast
Total No. of Vessels		30

Of the total 30 vessels present 87% were small ships. Of the total 26 small ships present 6 headed Southeast and East, 6 headed Northwest and West, 7 headed North and 7 headed South. Of the 4 large ships present the majority headed Southwest. There was no major direction observed from the data collected, as well as no major route, except for a majority of vessels travelling within 2½ nautical miles from the radar van, as evident in the following data.

<u>Route</u>	<u>Easterly</u>	<u>Westerly</u>	<u>Northern</u>	<u>Southern</u>
L.I. Sound	1 large	3 large		
L.I. Sound to Huntington Bay	2 small			
L.I. Sound to Smithtown Bay	1 small			

<u>Route</u>	<u>Easterly</u>	<u>Westerly</u>	<u>Northern</u>	<u>Southern</u>
Huntington Bay toward Smithtown Bay	3 small			
Smithtown Bay to L.I. Sound		1 small		
Smithtown Bay to Huntington Bay		5 small		
Huntington Bay to L.I. Sound			7 small	
L.I. Sound to Huntington Bay				7 small

- Avery Point (coverage 0900-1700, 6 May 1975)

(Long Island Sound is abbreviated here as L.I. Sound)

<u>Type of Vessel</u>	<u>No. of Vessels Present</u>	<u>Route and Direction</u>
Small Ships	1	New London Harbor to L.I. Sound
	1	Block Island Sound to New London Harbor
	2	Block Island Sound to L.I. Sound
	4	L.I. Sound to New London Harbor
	1	Fishers Island Sound, SE
	1	Fishers Island, South
	2	Ferry Route - Fishers Island to New London Harbor (2 South, 2 North)
Large Ships	2	Block Island Sound to L.I. Sound
	2	L.I. Sound to Block Island Sound
	1	L.I. Sound to New London Harbor
	2	New London Harbor to L.I. Sound
	1	New London Harbor to Dumping Gd. - South
	1	New London Harbor to Dumping Gd. - North
	1	Block Island Sound to anchor
	1	New London Harbor to Fishers Island Sound
	4	Ferry Route - New London Harbor to L.I. Sound
	1	Ferry Route - L.I. Sound to New London Harbor
Tug with Tow	2	Block Island Sound to L.I. Sound
Total No. of Vessels	32	

Out of a total of 32 vessels present there were 16 large, 14 small and 2 tugs with tow. Of the total vessels present, 13 headed in a westerly direction (3 small, 8 large vessels, and 2 tugs with tow), 10 in an easterly direction (5 large and 5 small vessels), 4 in a northerly direction (2 large and 2 small vessels) and 3 in a southerly direction (2 small and 1 large vessel). As evident from the data, there was not a majority of a specific type of vessel, there was no dominant direction but there were two main routes traveled. One was from Long Island Sound to New London Harbor (5 small and 5 large vessels) and the other was from Block Island Sound to Long Island

Sound (2 small, 4 large vessels and 2 tugs with tow).

The following data describes the kinds of vessels utilizing each route.

<u>Route</u>	<u>Easterly</u>	<u>Westerly</u>	<u>Northern</u>	<u>Southern</u>
L.I. Sound to New London Harbor	4 small 1 large	1 small 2 large		
L.I. Sound to Block Island Sound	2 large	2 small 2 large 2 tugs with tow		
Block Island Sound to New London Harbor			1 small	
New London Harbor to Fishers Island Sound	1 large			
Fishers Island Sound	1 small			1 small
Ferry Route - New London Harbor to Fishers Island			2 small	2 small
Ferry Route - New London Harbor to Orient Pt.	1 large	4 large		
Block Island Sound to anchor			1 large	

Two large ships went from New London Harbor to the Dumping Area and back to New London Harbor - North and South.

3. Vessel Speed

Observed speeds in the Long Island Sound had the following ranges:

- Eatons Neck Point 4-14 knots (8.6 knot average)
- Avery Point 5-20 knots (12.2 knot average)

The following data represents the fastest, slowest, and average speed (given in knots) for each type of vessel present - according to site.

- Eatons Neck Point

<u>Type of Vessel</u>	<u>No. of Vessels Present</u>	<u>Fastest</u>	<u>Slowest</u>	<u>Average</u>
Large Ship	40	14	5	8.9
Tug with Tow	11	11	4	7.5
Total	51			

• Avery Point

<u>Type of Vessel</u>	<u>No. of Vessels Present</u>	<u>Fastest</u>	<u>Slowest</u>	<u>Average</u>
Small Ship	6	14	5	11.2
Large Ship	41	20	6	12.6
Tug with Tow	3	12	6	9.3
Total	<u>50</u>			

The following data presents the different speeds, for each type of vessel, at each site:

<u>Small Ships at:</u>	<u>No. of Vessels Present</u>	<u>Fastest</u>	<u>Slowest</u>	<u>Average</u>
Eatons Neck Point	0	-	-	-
Avery Point	6	14	5	11.2

<u>Large Ships at:</u>	<u>No. of Vessels Present</u>	<u>Fastest</u>	<u>Slowest</u>	<u>Average</u>
Eatons Neck Point	40	14	5	8.9
Avery Point	41	20	6	12.6
	Average	<u>17.0</u>	<u>5.5</u>	<u>10.8</u>

<u>Tugs with Tow at:</u>	<u>No. of Vessels Present</u>	<u>Fastest</u>	<u>Slowest</u>	<u>Average</u>
Eatons Neck Point	11	11	4	7.5
Avery Point	3	12	6	9.3
	Average	<u>11.5</u>	<u>5.0</u>	<u>8.4</u>

4. Close Encounters

The observed rate of close encounters are as follows:

Eatons Neck Point 21 in 48 hours (.44) out of 52 total encounters
 Avery Point 23 in 24 hours (.96) out of 49 total encounters

The numbers in parenthesis were obtained by dividing the number of close encounters into the number of hours (i.e. number of close encounters per hour). The ratio between Avery Point and Eatons Neck Point of close encounters per hour is 2 to 1. Below, the close encounters observed are categorized in vessel-type combinations, the total number of encounters observed involving each combination, and their range in yards. The manner of approach is also given (P = Passing, O = Overtaking, C = Crossing). Radar resolution limits the accuracy of measured distances.

• Eatons Neck Point (48-hour coverage)

No. & Manner of Approach			Type of Vessel Combination	No. of Combinations Observed	Range of Close Encounters (Yards)
P	O	C			
8	6	-	2 small ships	13	25 - 300
1	1	-	2 large ships	2	150 - 300
-	-	1	1 small ship and 1 large ship	1	25
4	-	-	1 large ship and 1 tug	4	100 - 300
13	7	1	Totals	21	

• Avery Point (24-hour coverage)

No. & Manner of Approach			Type of Vessel Combination	No. of Combinations Observed	Range of Close Encounters (Yards)
P	O	C			
10	2	-	2 small ships	12	30 - 380
4	3	-	2 large ships	7	100 - 400
4	-	-	1 small ship and 1 large ship	4	90 - 280
18	5	0	Totals	23	

5. Message Activity

Message activity exhibited the following peak and average values for channel 13:

<u>Site</u>	<u>Day of Coverage</u>	<u>Peak No. of Messages</u>	<u>Time of Peak</u>	<u>Average No. of Messages</u>
Eatons Neck Point	Thursday, 17 April 1975	230	0610 - 0615	115
Avery Point	Thursday, 1 May 1975	510	0610 - 0615	49

6. Channel Utilization

Channel 13 utilization exhibited the following peak and average percentages:

<u>Site</u>	<u>Day of Coverage</u>	<u>Peak (%)</u>	<u>Time of Peak</u>	<u>Average %</u>
Eatons Neck Point	Thursday, 17 April 1975	22	0145 - 0200	15
Avery Point	Thursday, 1 May 1975	16	1430 - 1445	4

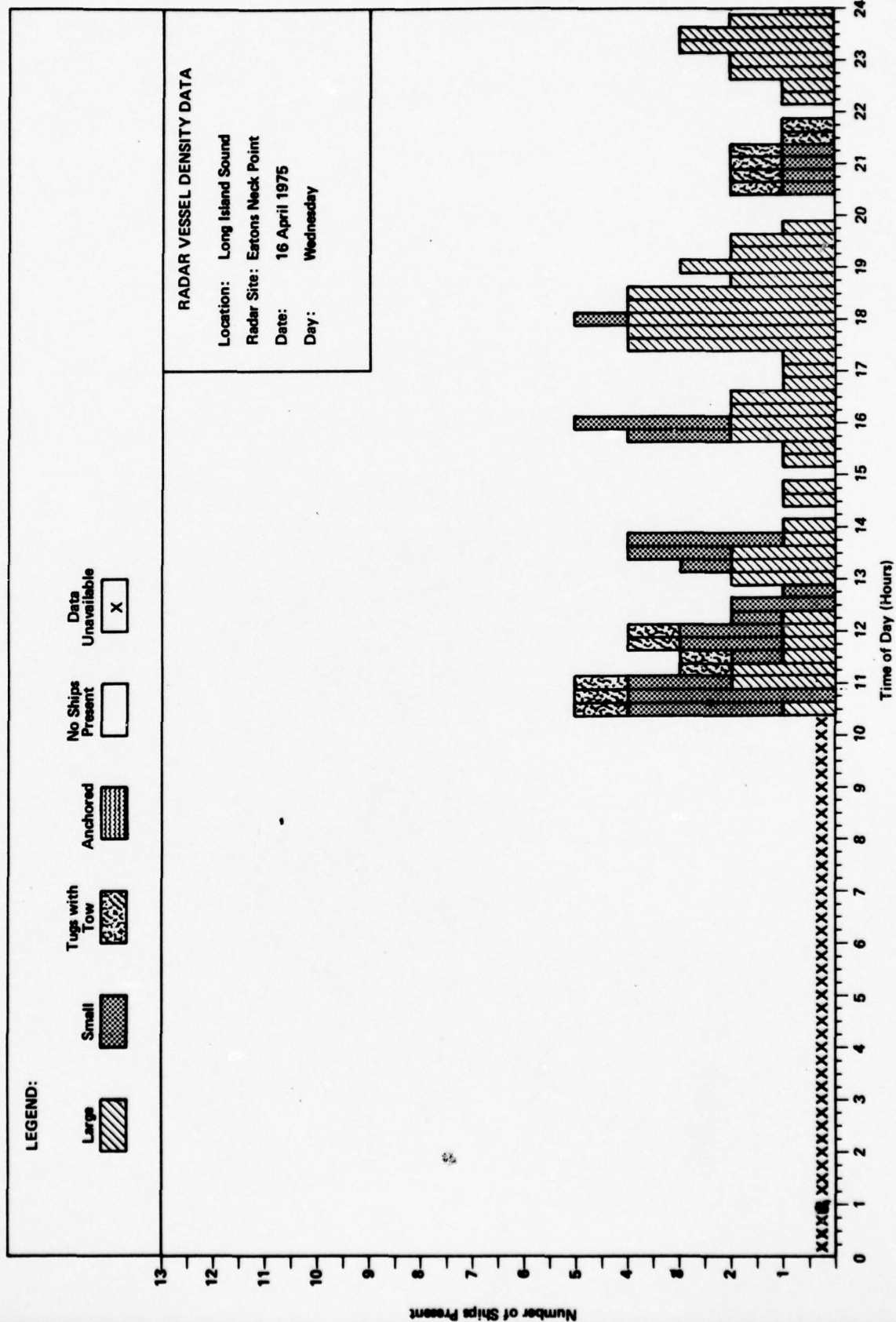
7. Channel Efficiency

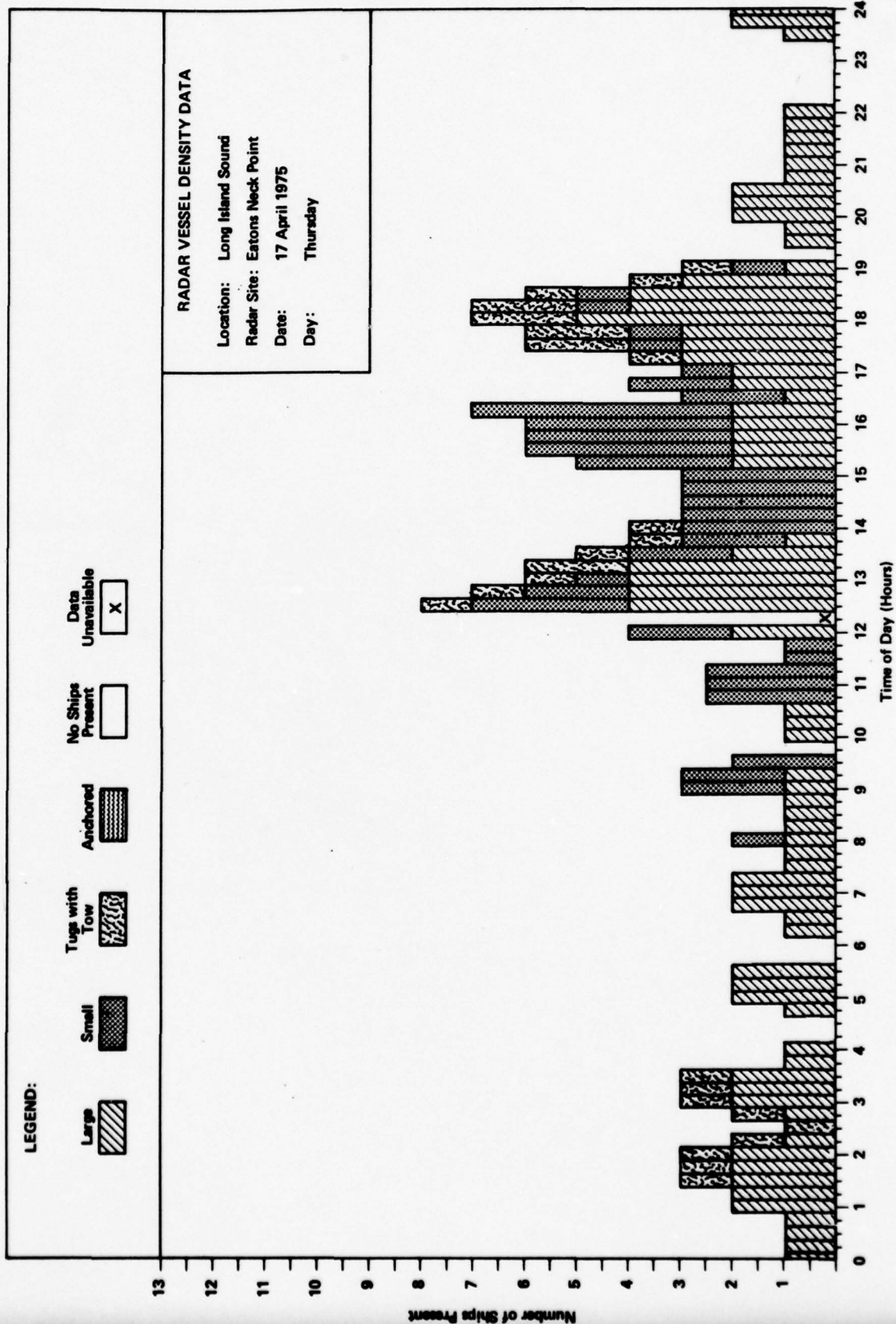
Channel efficiency data are as follows:

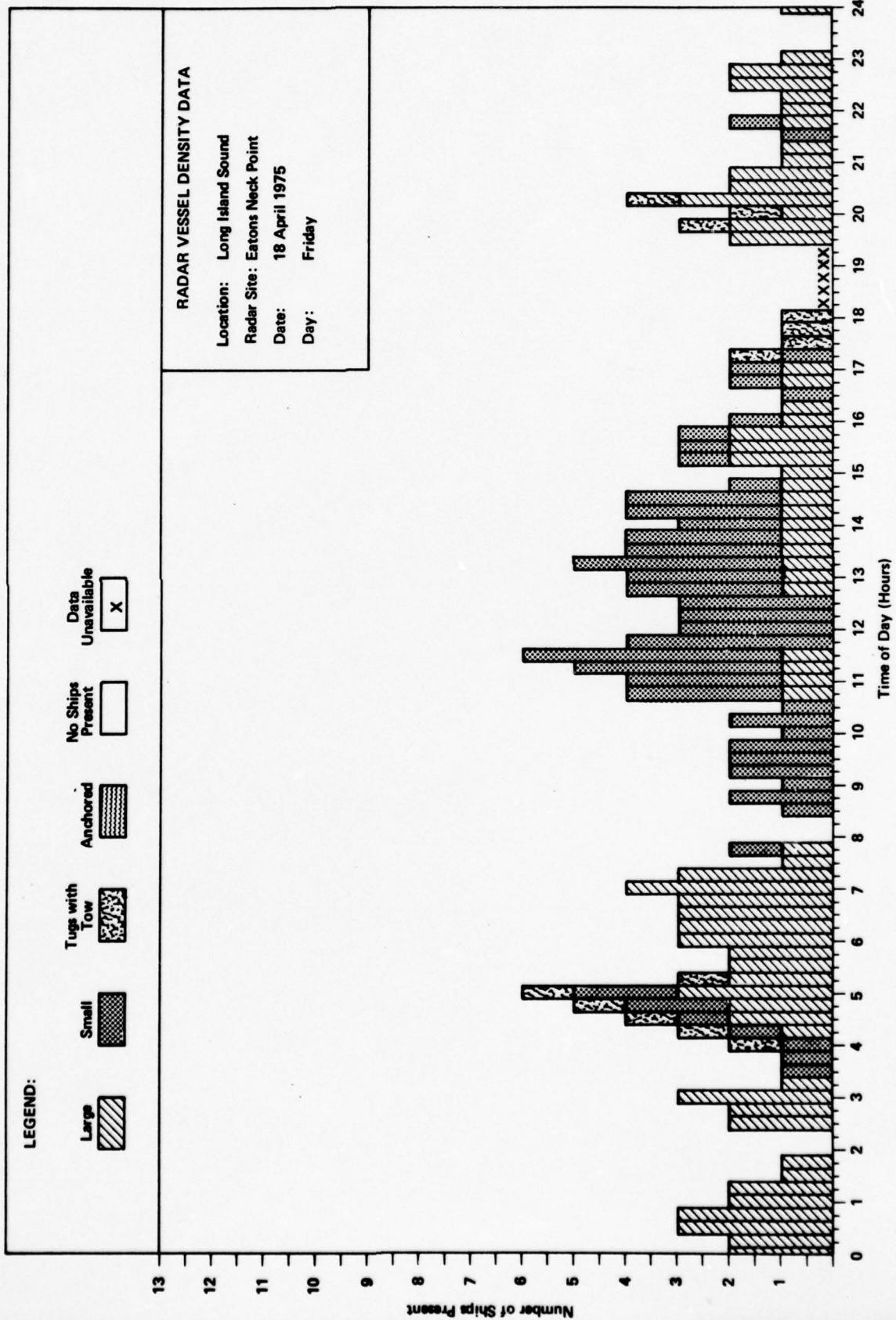
<u>Site</u>	<u>Peak (%)</u>	<u>Average (%)</u>
Eatons Neck Point	100	78
Avery Point	100	73

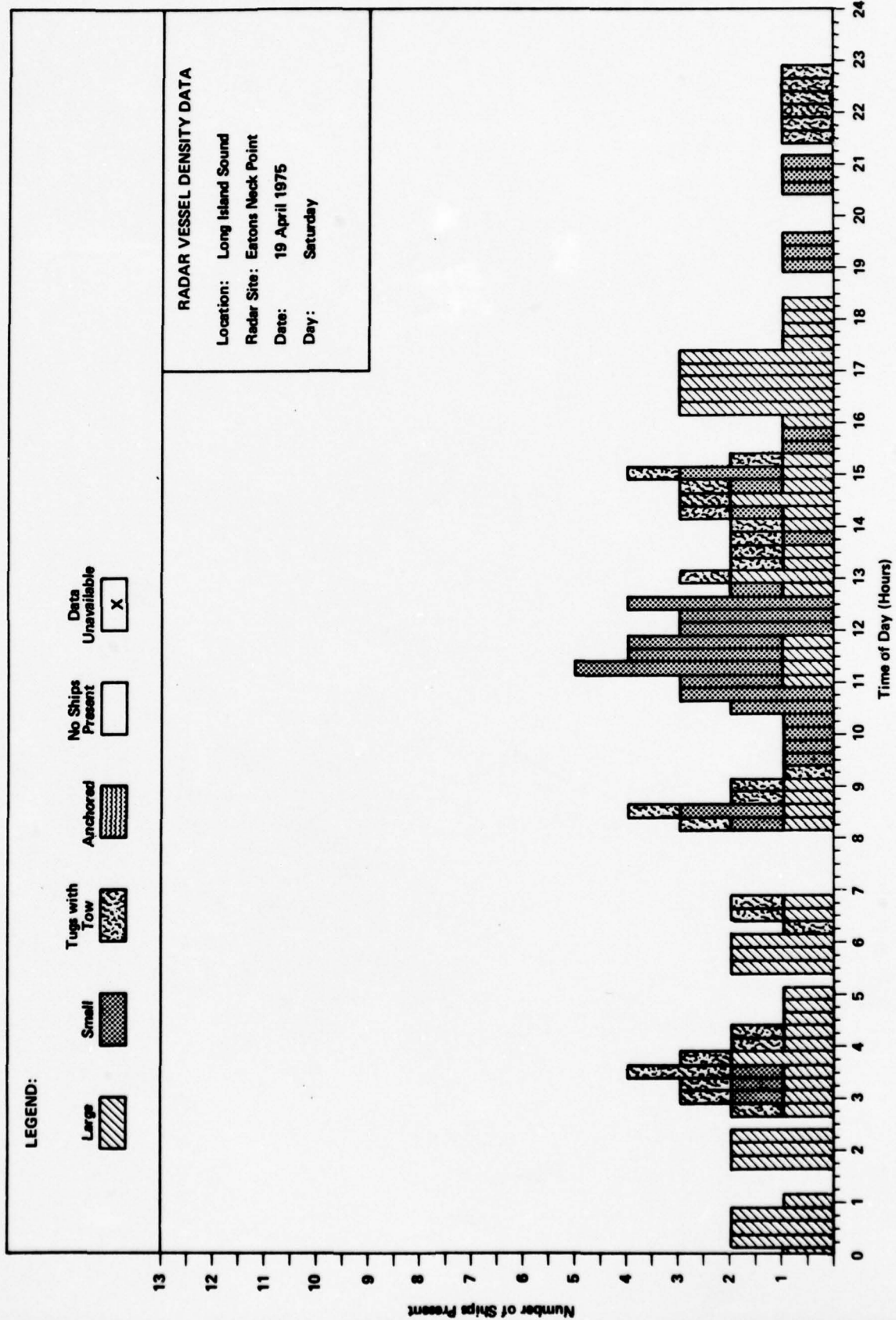
II. DATA

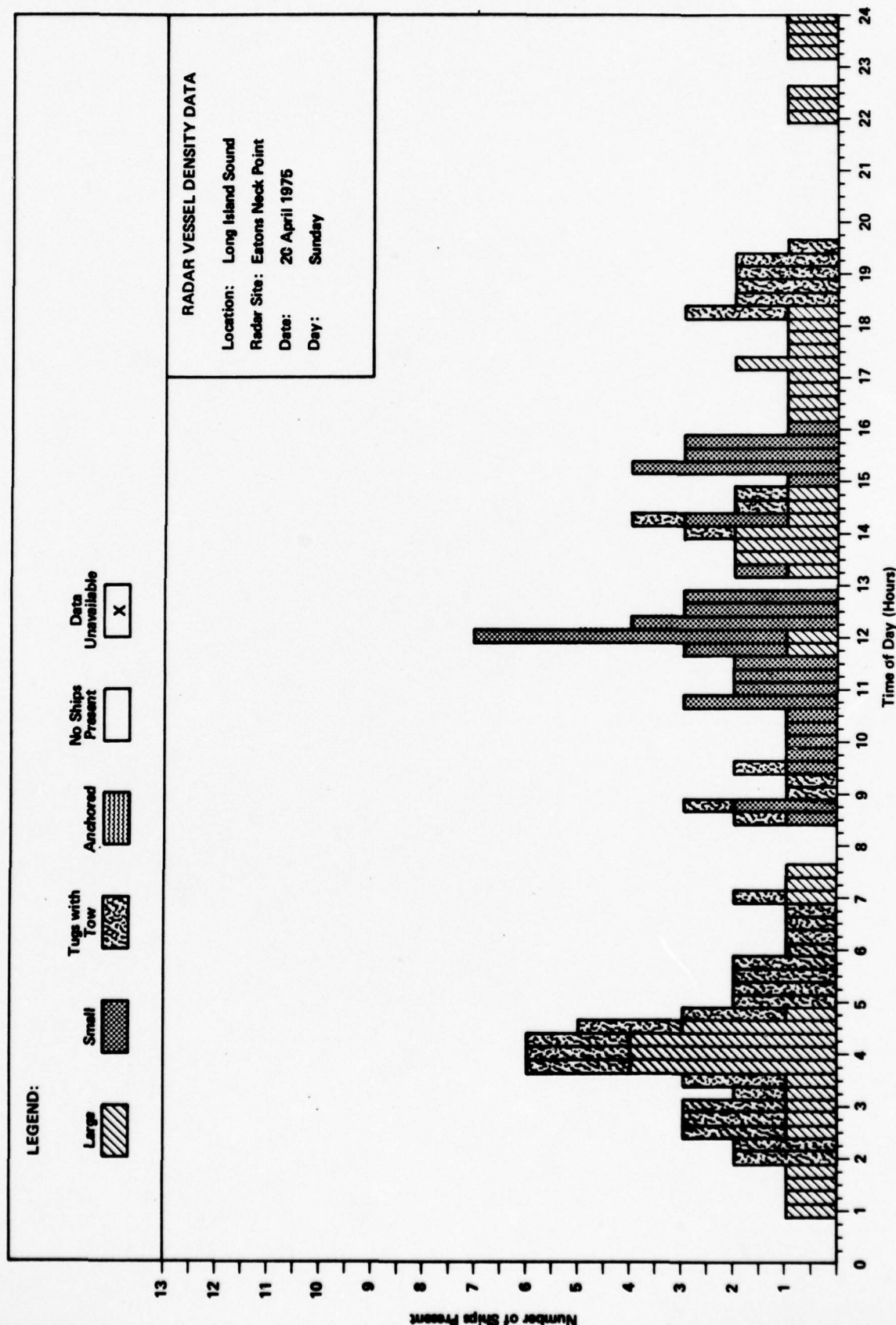
2.1 DATA FROM EATONS NECK POINT

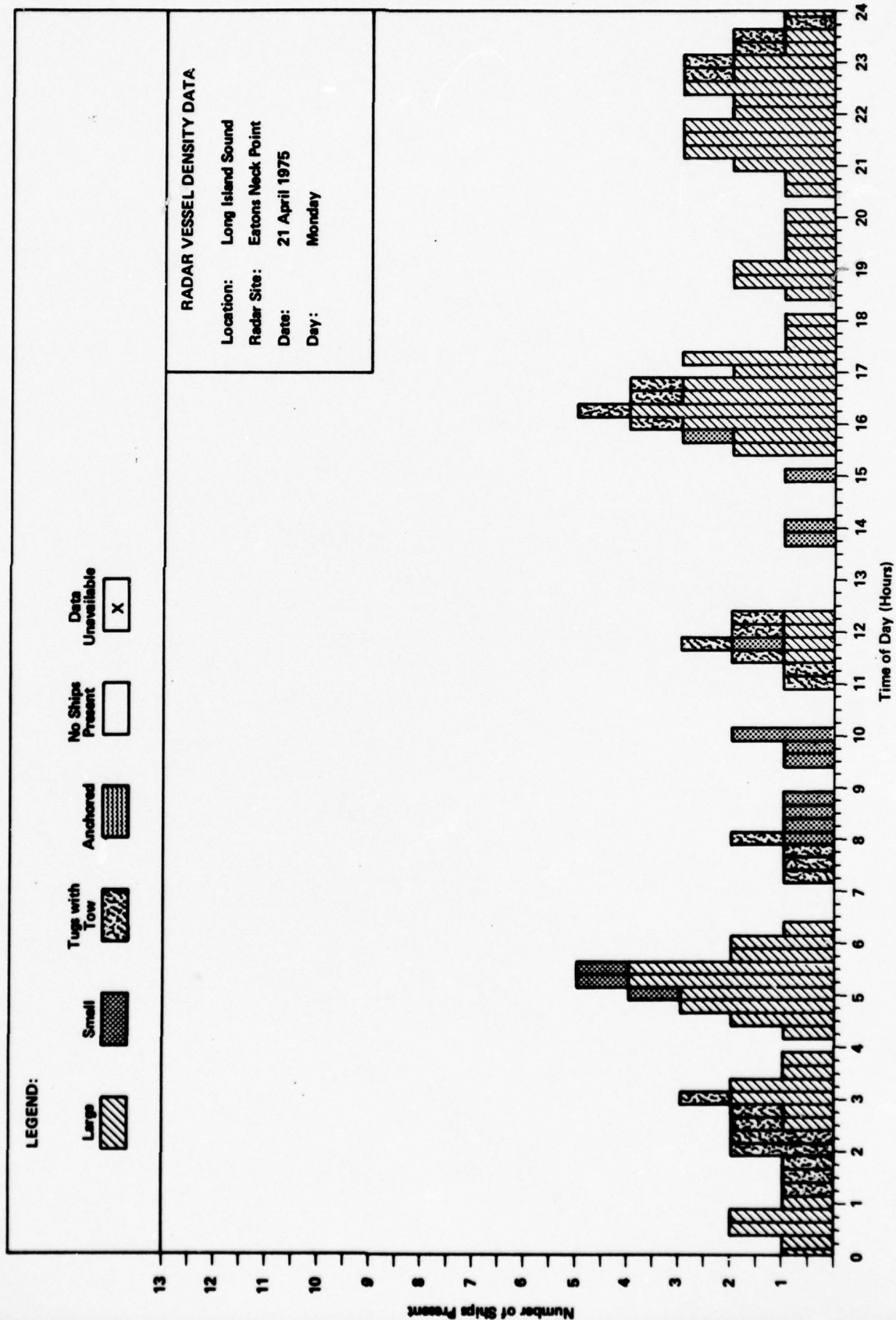


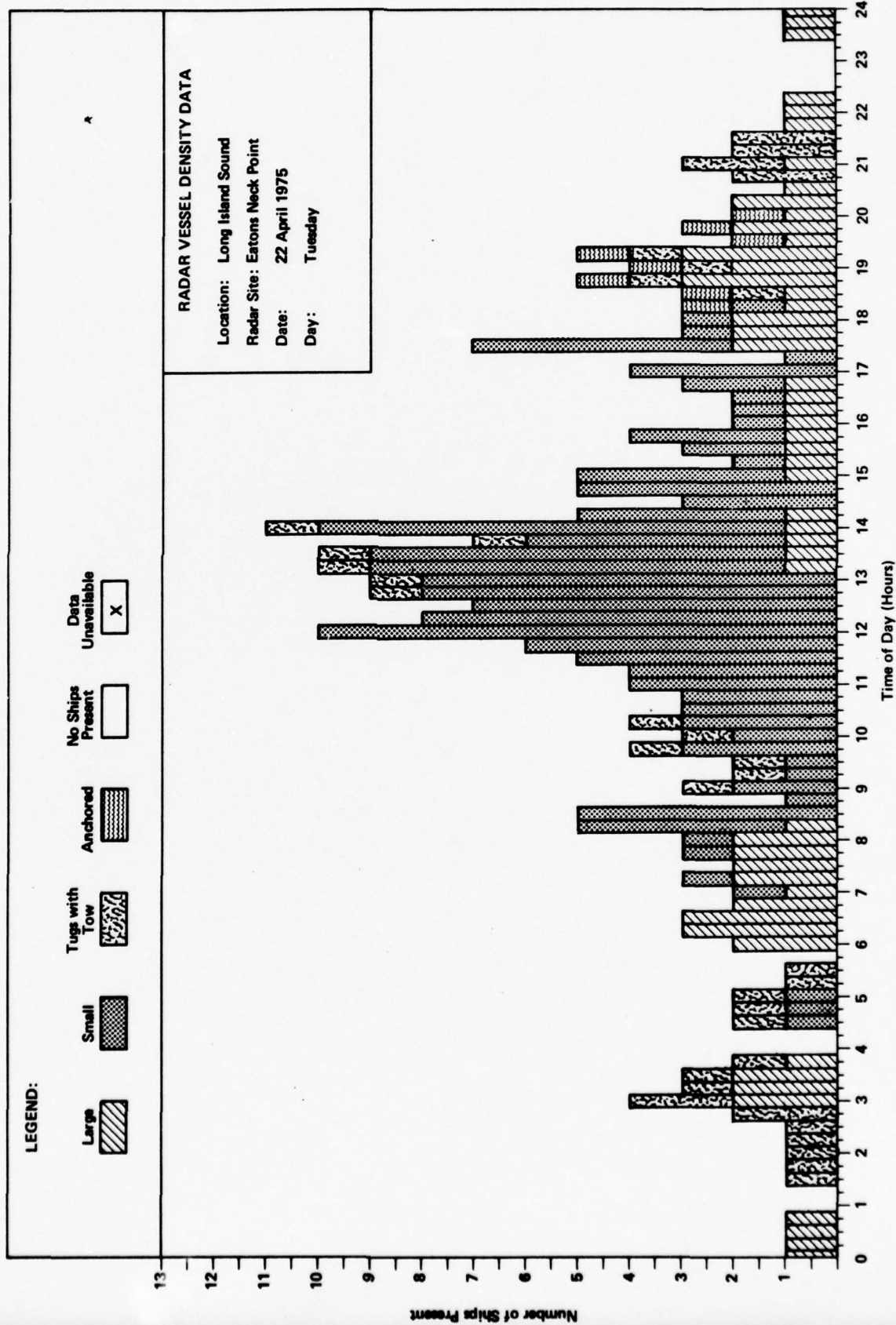


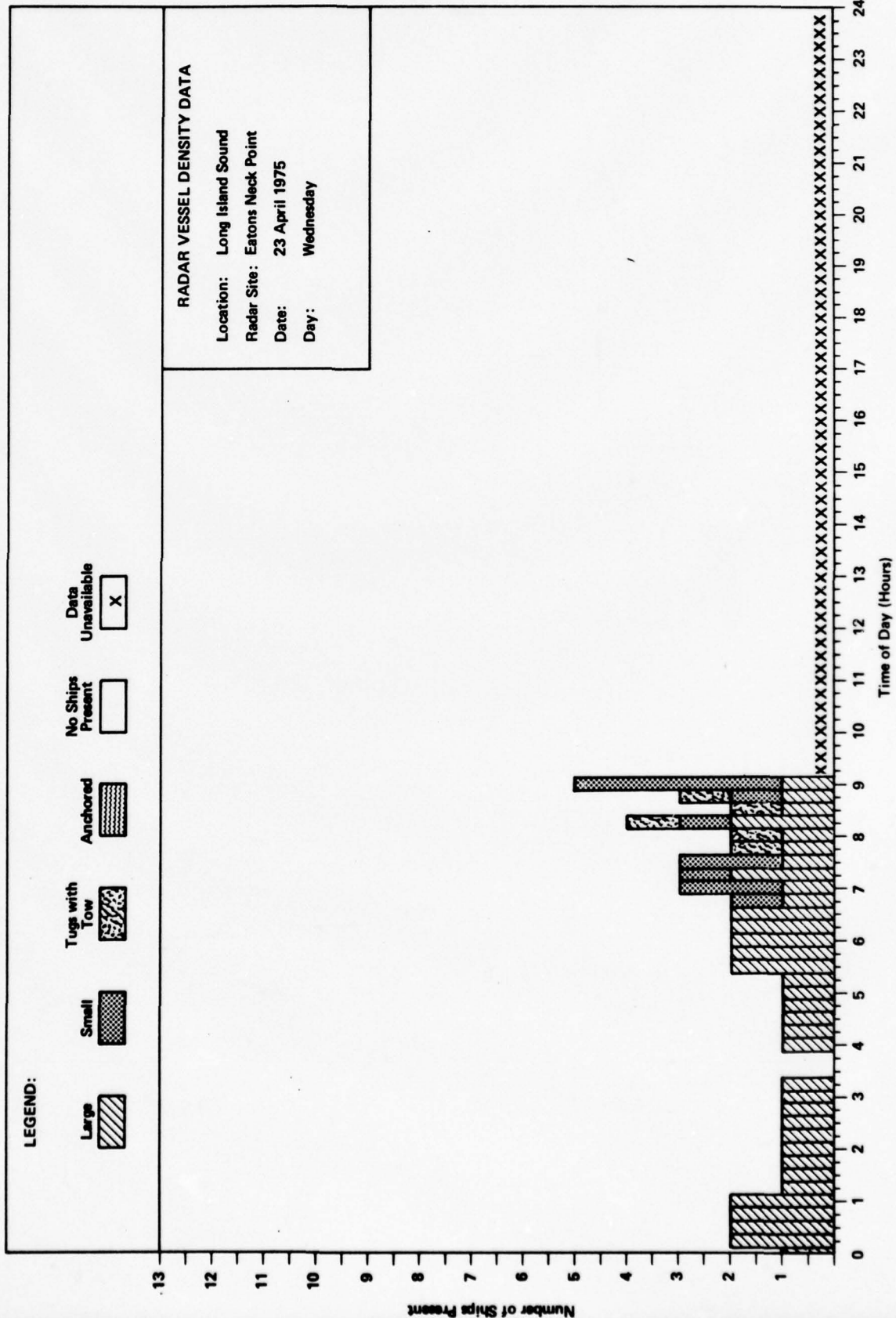






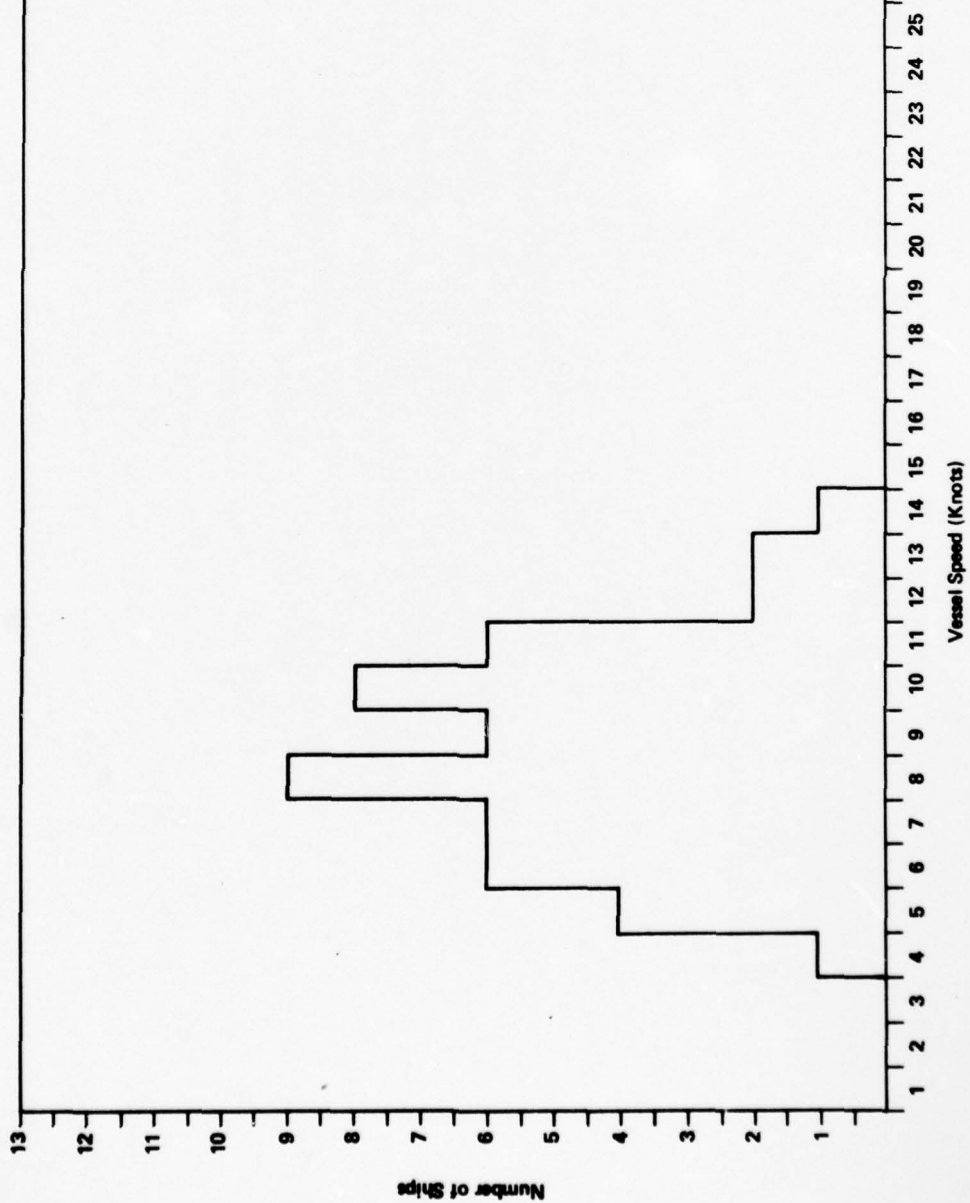






RADAR VESSEL SPEED DATA

Location: Long Island Sound
 Sample Size: 51
 Radar Site: Eastons Neck Point
 Date: 16-19 April 1975
 Day: Wednesday - Saturday



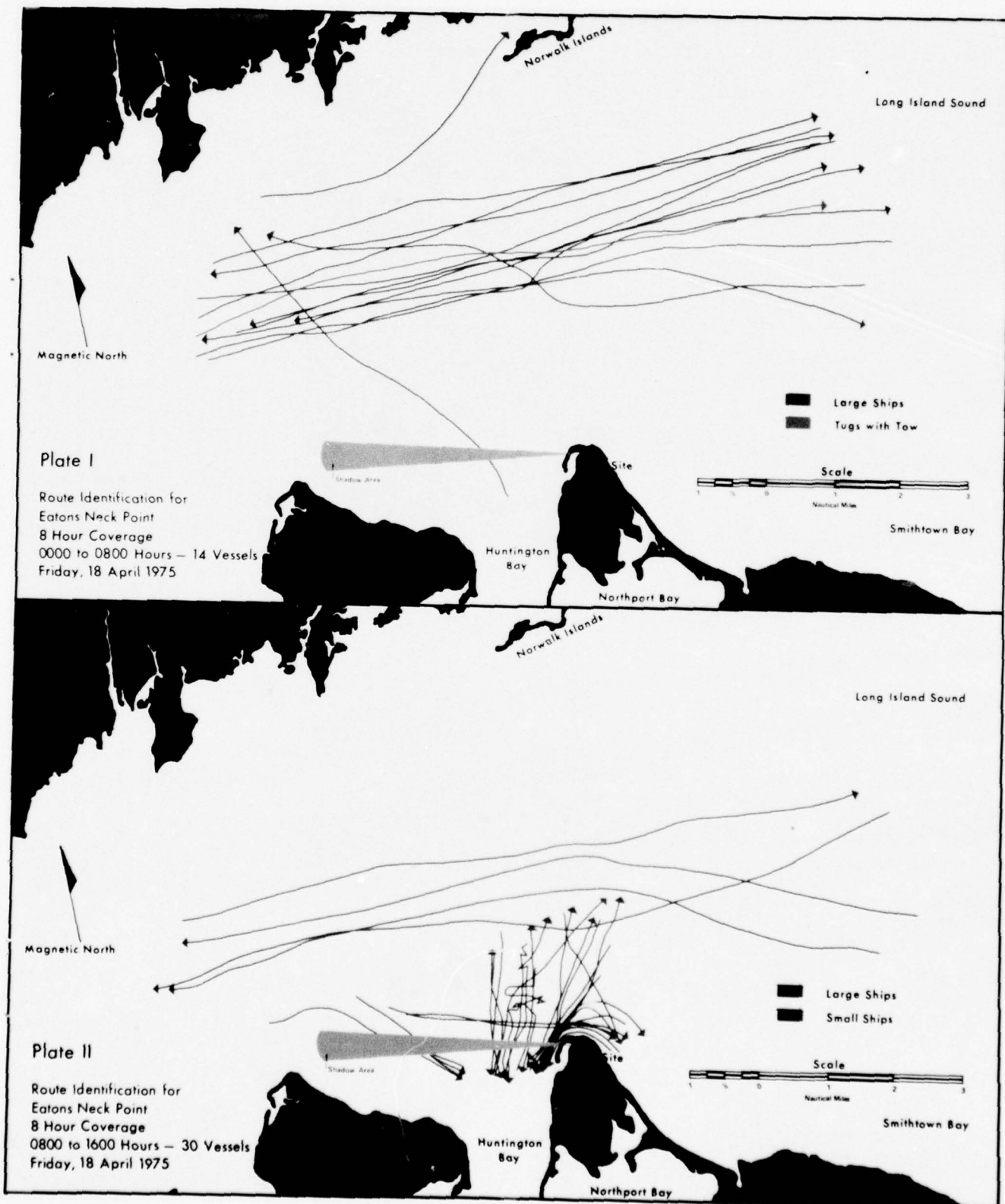
SPEED DATA
FOR
EATONS NECK POINT *

Vessel No.	Vessel Size	Average Speed in Knots	Direction	Day	Time Hour/Minute
1	tug with tow	8	NE	Wednesday 16 April 1975 ↑	10 29
2	large	6	NE		11 00
3	large	7	NE		12 54
4	large	9	NE		14 28
5	large	8	NE		15 20
6	large	6	NE		15 37
7	large	10	SW		17 21
8	large	7	NE		17 27
9	large	12	NE		17 38
10	large	13	SW		17 51
11	large	10	NE		18 20
12	large	14	SW		18 25
13	large	11	NE		18 59
14	tug with tow	8	NE		20 28
15	large	8	SW	Wednesday 16 April 1975 ↓	22 13
16	large	9	NE		22 41
17	large	11	SW		23 01
18	large	5	NE		00 02
19	large	6	NE		01 03
20	tug with tow	5	NE		01 25
21	large	7	SW		02 41
22	large	9	SW		06 11
23	large	11	SW		06 44
24	large	8	SW		07 31
25	large	13	SW	Thursday 17 April 1975 ↑	08 37
26	tug with tow	5	SW		11 46
27	large	6	NE		12 02

* Speed calculation of small ships was impossible here. Small ships are discernable at only a small locus of the site's total range (see route identification chart) and the sudden stopping and starting that typifies their behavior further constricts accurate speed measurements.

SPEED DATA
FOR
EATONS NECK POINT (Cont'd)

Vessel No.	Vessel Size	Average Speed in Knots	Direction	Day	Time Hour/Minute	
28	large	6	NE	Thursday 17 April 1975 ↑	12	06
29	tug with tow	11	SW		13	16
30	large	8	NE		15	08
31	tug with tow	6	NE		16	37
32	large	5	NE		17	01
33	tug with tow	4	SW		17	06
34	large	10	SW		17	11
35	large	7	NE		17	29
36	large	10	SW		17	48
37	large	8	SW		17	55
38	large	9	NE	Thursday 17 April 1975	19	52
39	large	9	NE		20	54
40	large	9	NE	Friday 18 April 1975	00	17
41	large	7	NE		00	36
42	large	12	SW	↑ Friday 18 April 1975 ↓	02	22
43	tug with tow	7	NE		03	55
44	large	10	SW		04	05
45	large	11	SW		04	23
46	large	8	NE		04	51
47	large	10	SW	Friday 18 April 1975	14	01
48	large	11	NE		22	02
49	tug with tow	10	SW	Saturday	02	41
50	tug with tow	10	SW	19 April	03	22
51	tug with tow	8	NE	1975	08	12



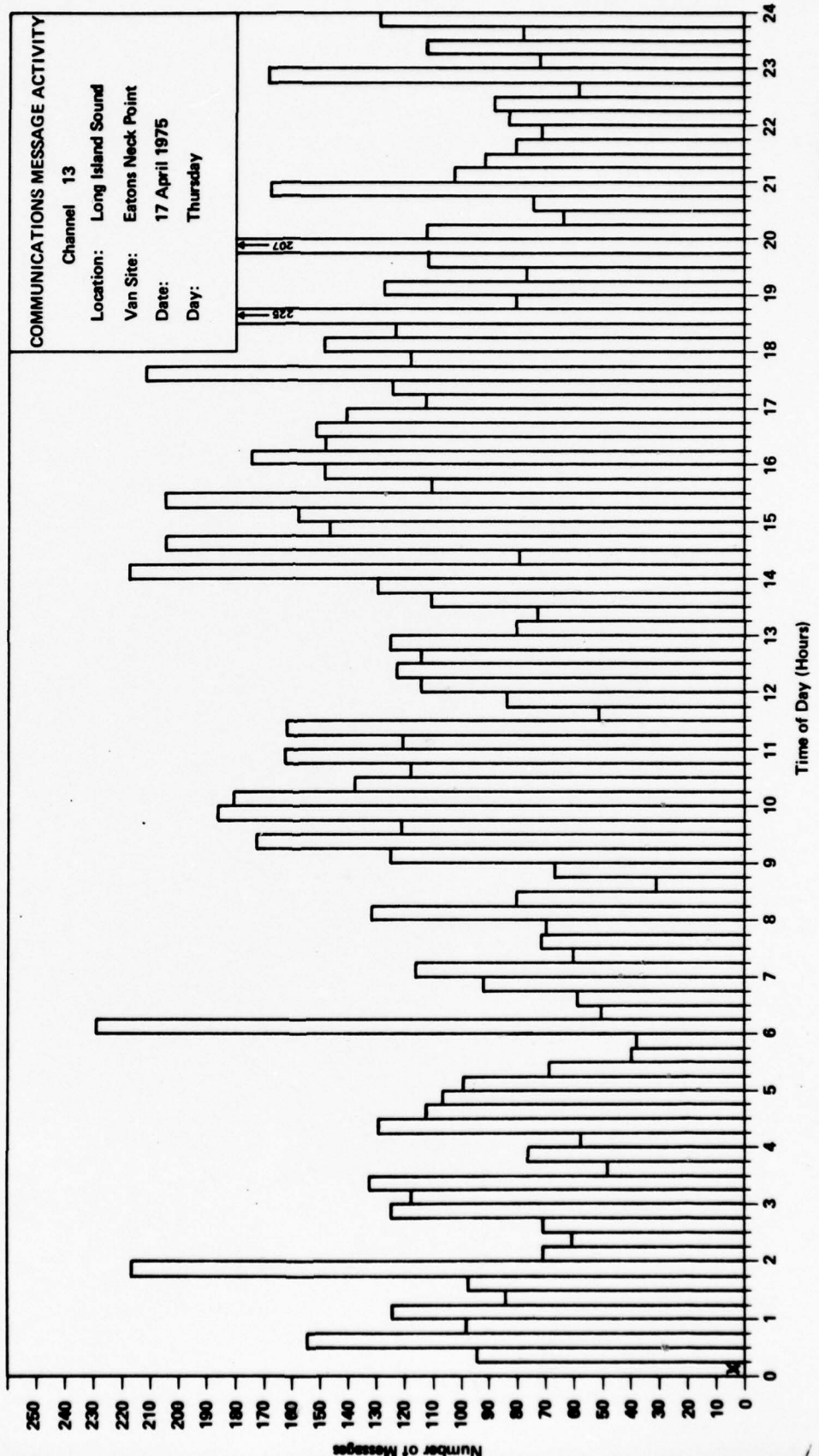
CLOSE ENCOUNTER
FOR
EATONS NECK POINT

No.	Day	Time Hour/Minute		Distance Yards	Size	Manner of Approach*
1	Friday 18 April 1975	19	50	<25	1 large, 1 small	C
2	Saturday 19 April 1975	03	16	300	1 tug, 1 large	P
3		08	29	<25	2 small	P
4		08	42	300	1 tug, 1 large	P
5		10	09	<25	2 small	O
6		10	47	300	2 small	O
7		11	06	<25	2 small	O
8		11	23	<25	2 small	P
9		11	24	<25	2 small	P
10		11	30	<25	2 small	O
11		11	35	300	2 small	P
12	Saturday 19 April 1975	11	36	<25	2 small	P
13		11	50	<25	2 small	O
14	Sunday 20 April 1975	02	51	<100	1 tug, 1 large	P
15		03	50	300	1 tug, 1 large	P
16		04	00	150	2 large	O
17		12	14	<25	2 small	P
18		12	15	<25	2 small	P
19		12	22	<25	2 small	P
20	Sunday 20 April 1975	12	30	<25	2 small	O
21		13	55	300	2 large	P

21 close encounters out of 52 encounters in 48 hours.

*P = Passing
O = Overtaking
C = Crossing

< = less than



COMMUNICATIONS CHANNEL
UTILIZATION

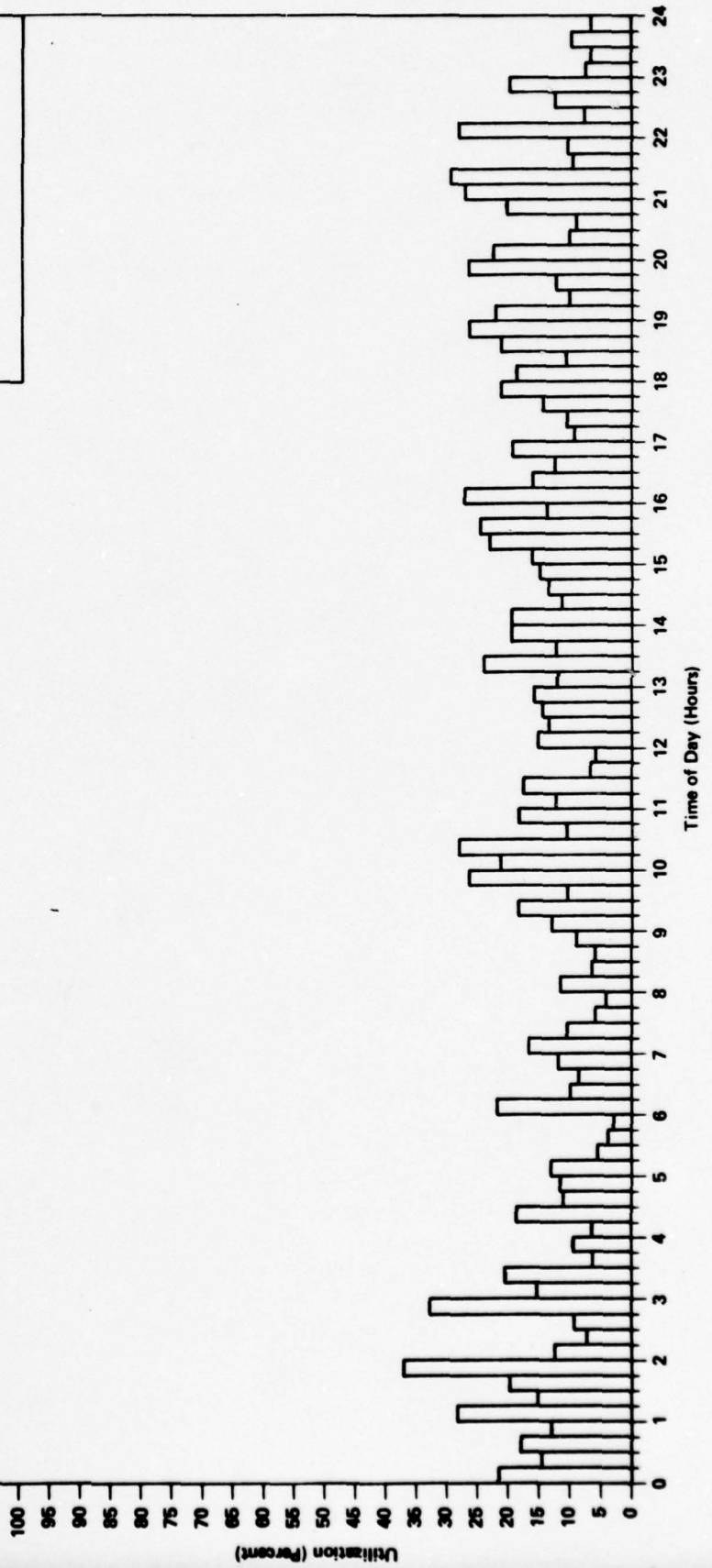
Channel 13

Location: Long Island Sound

Van Site: Eastons Neck Point

Date: 17 April 1975

Day: Thursday



COMMUNICATIONS CHANNEL EFFICIENCY

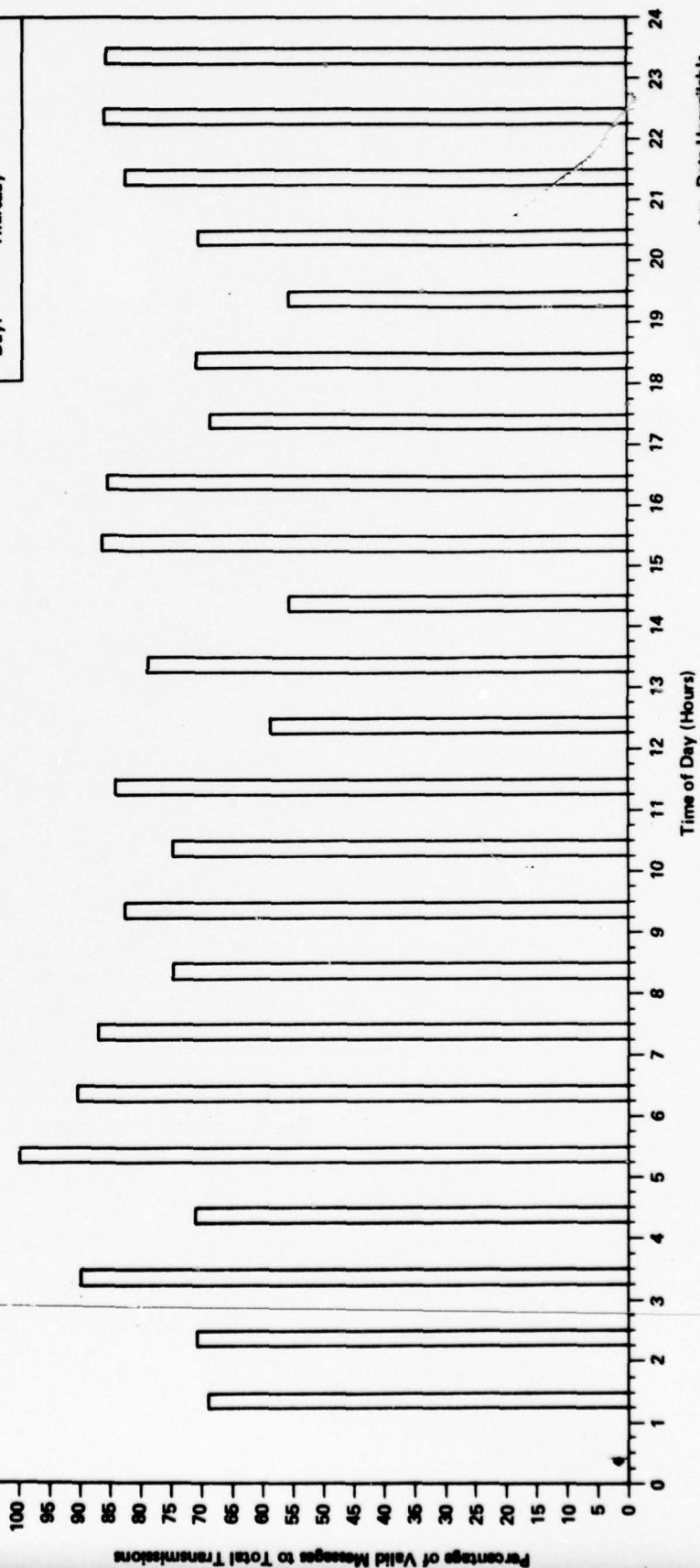
Channel 13

Location: Long Island Sound

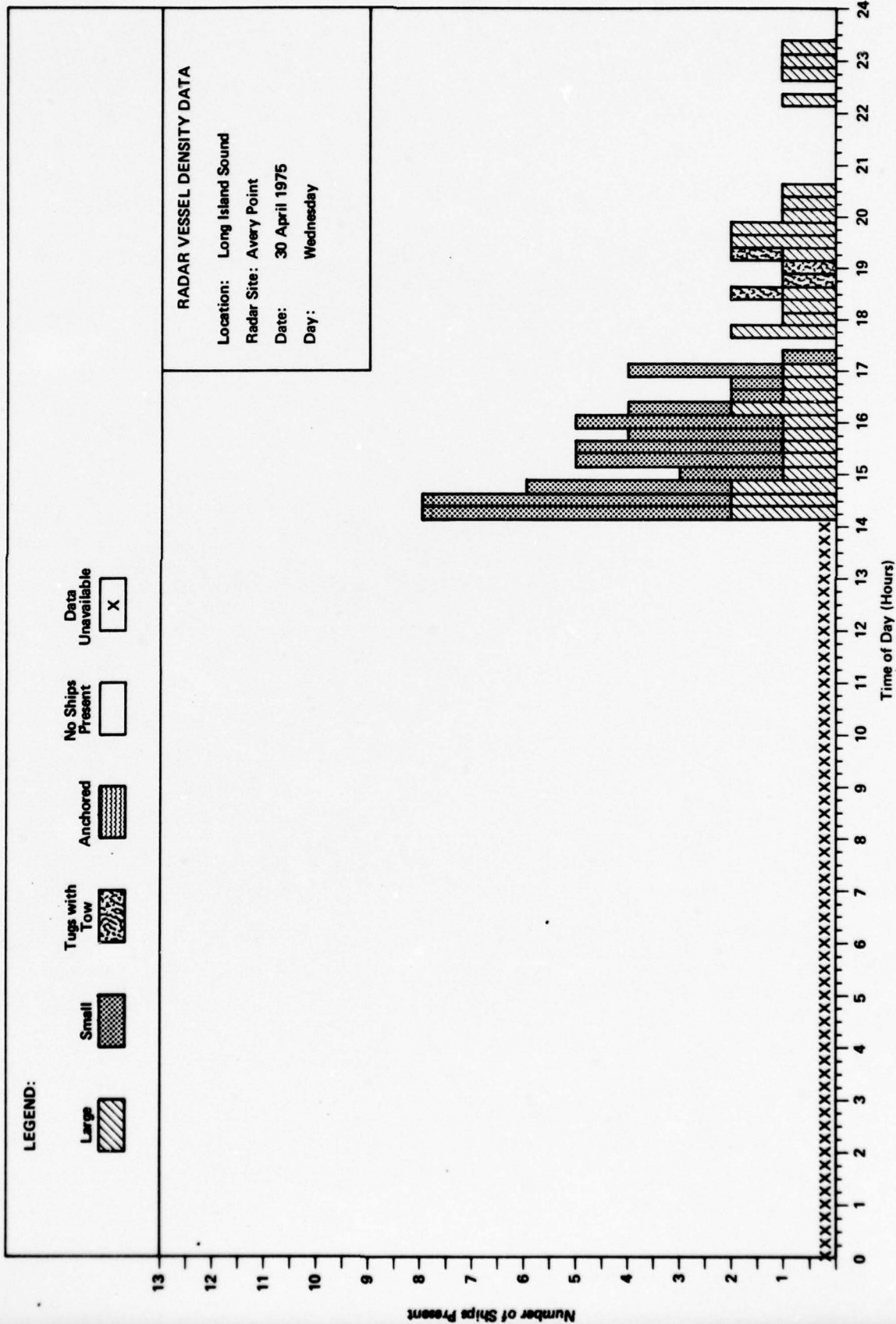
Van Site: Eatons Neck Point

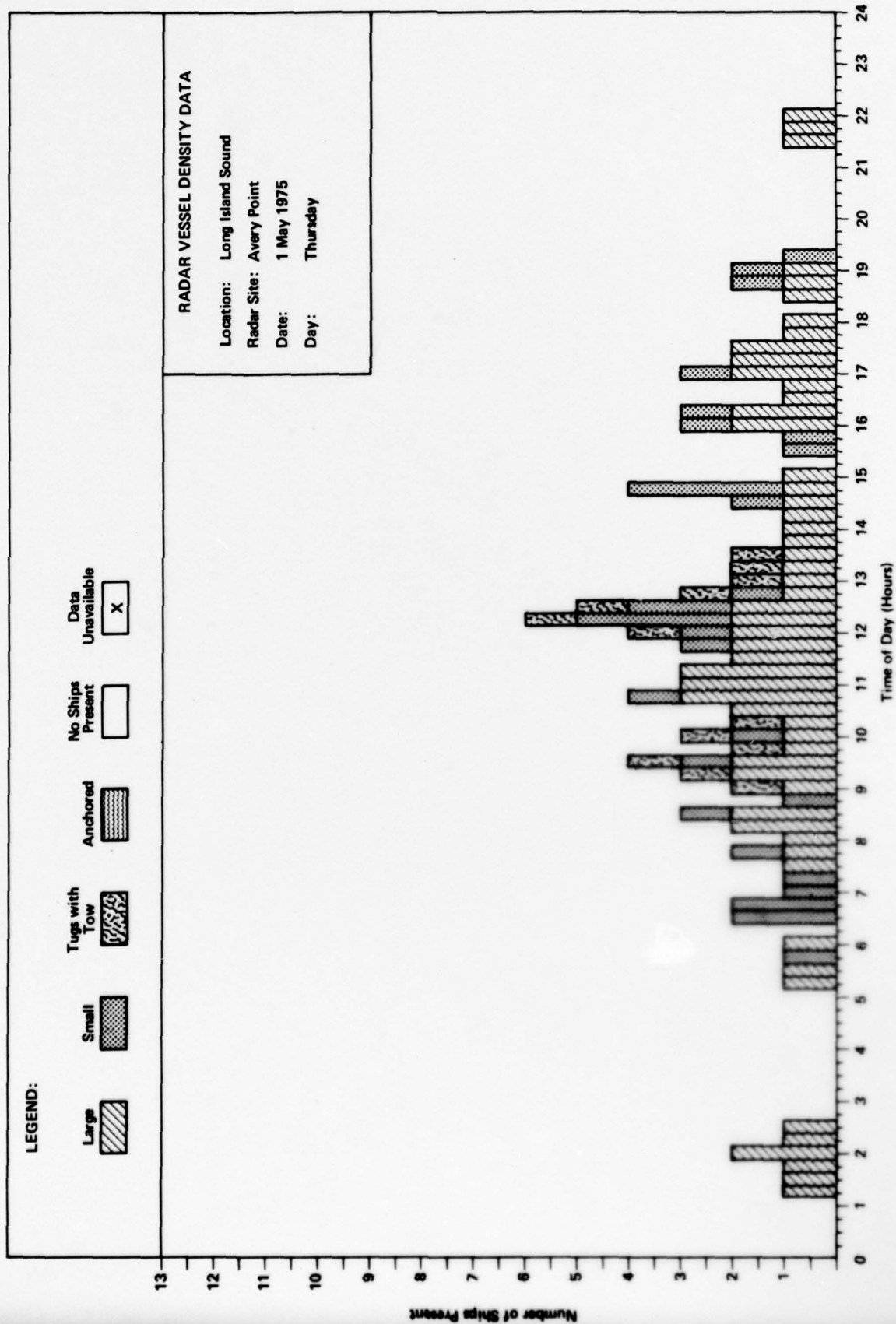
Date: 17 April 1975

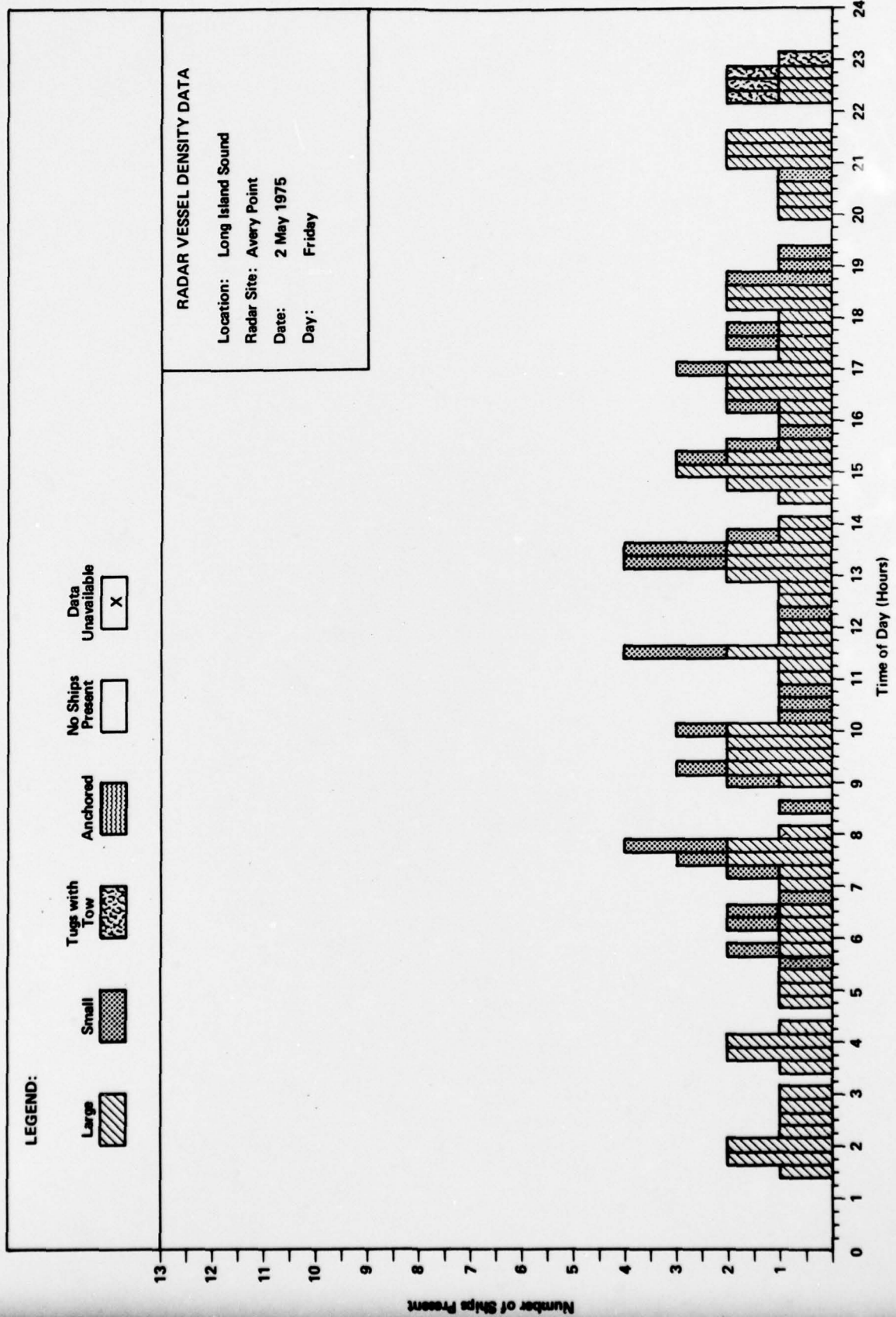
Day: Thursday

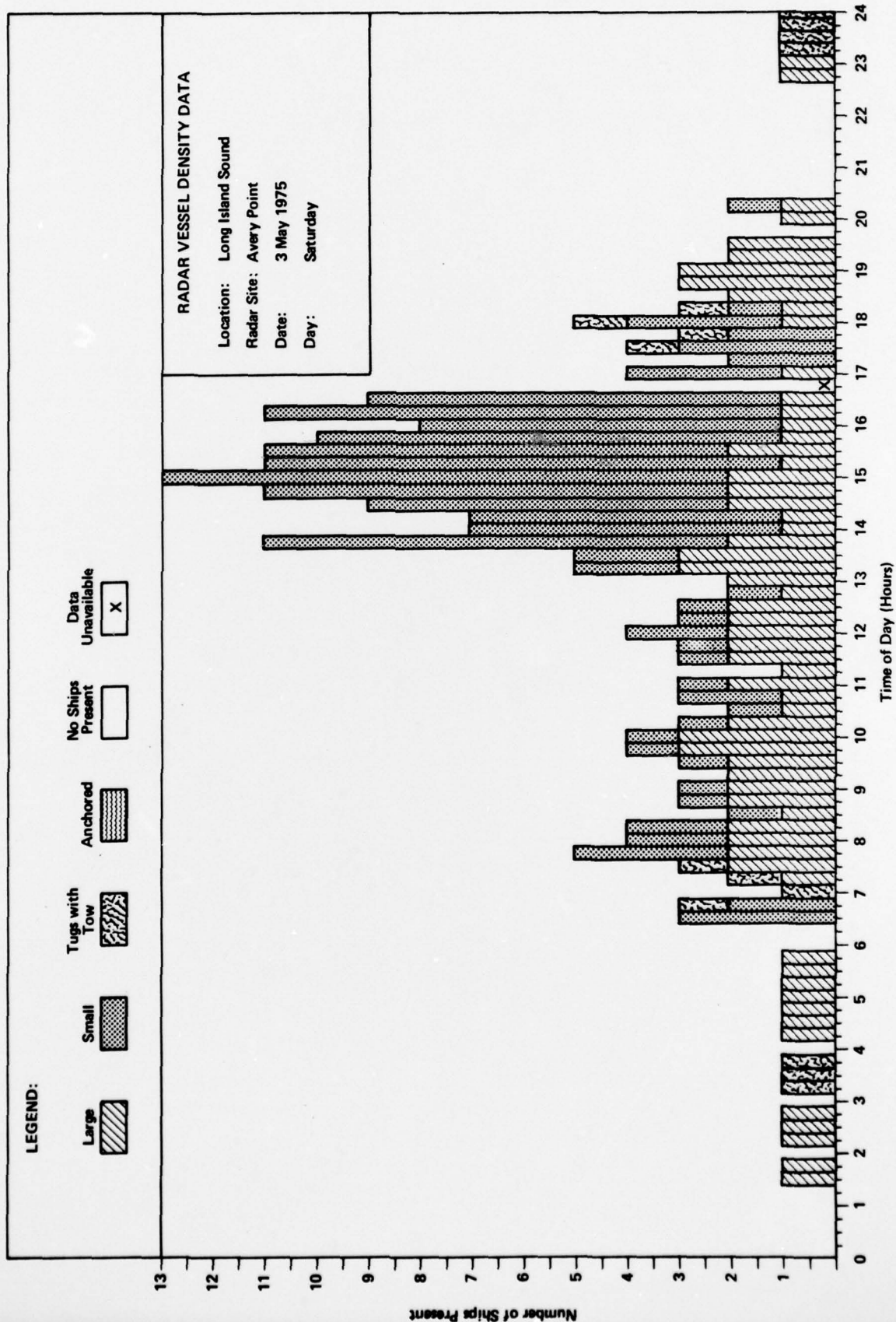


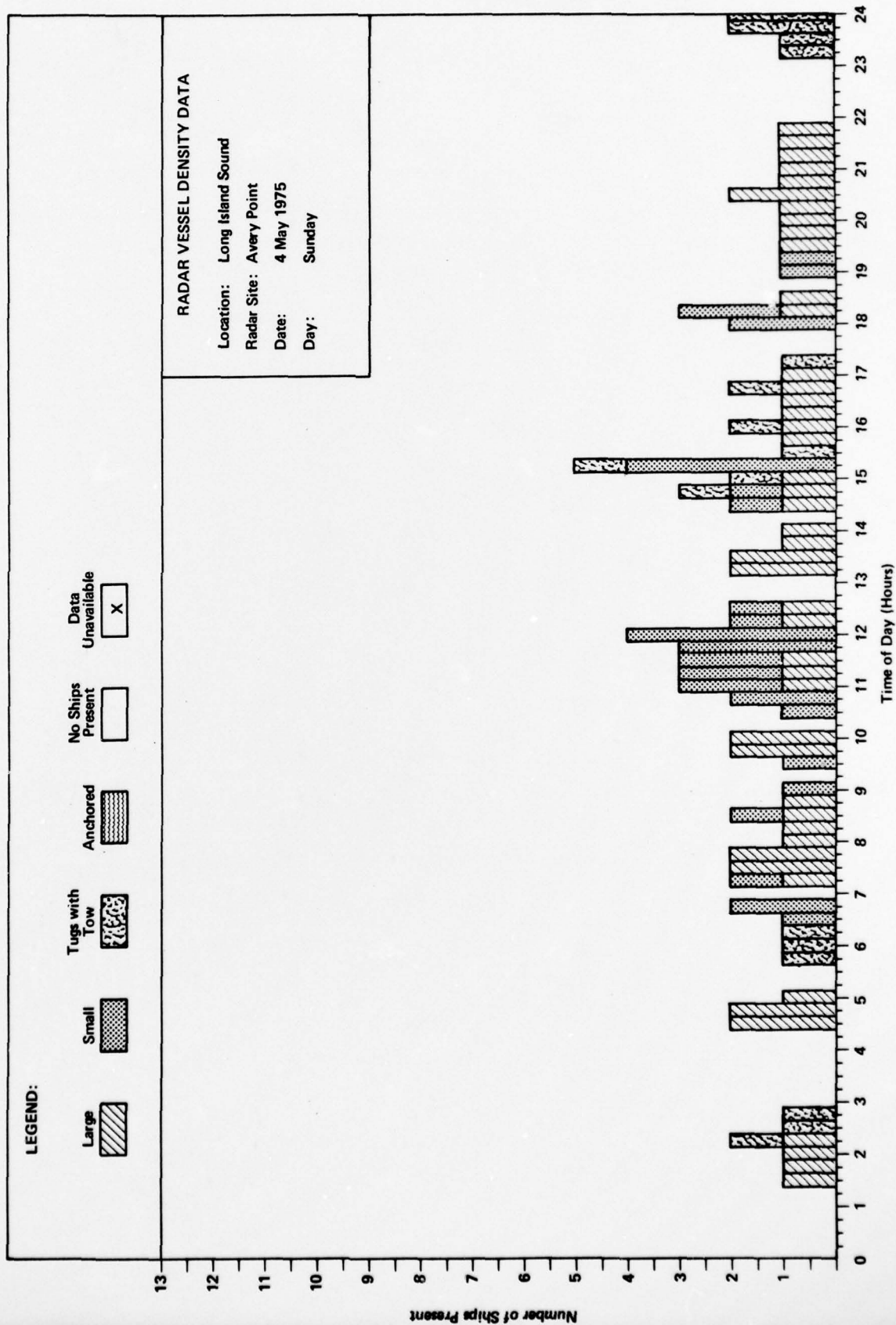
2.2 DATA FROM AVERY POINT

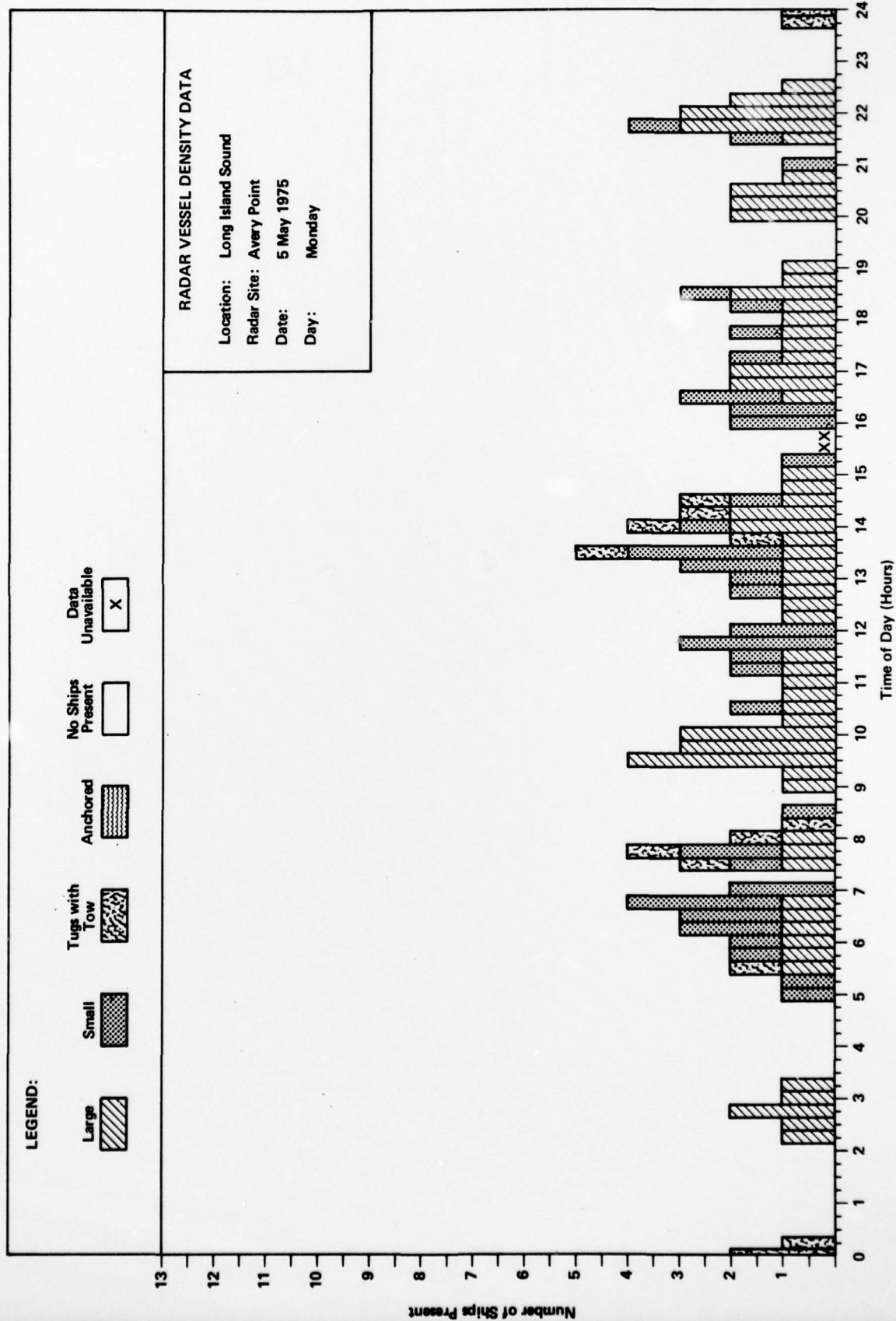


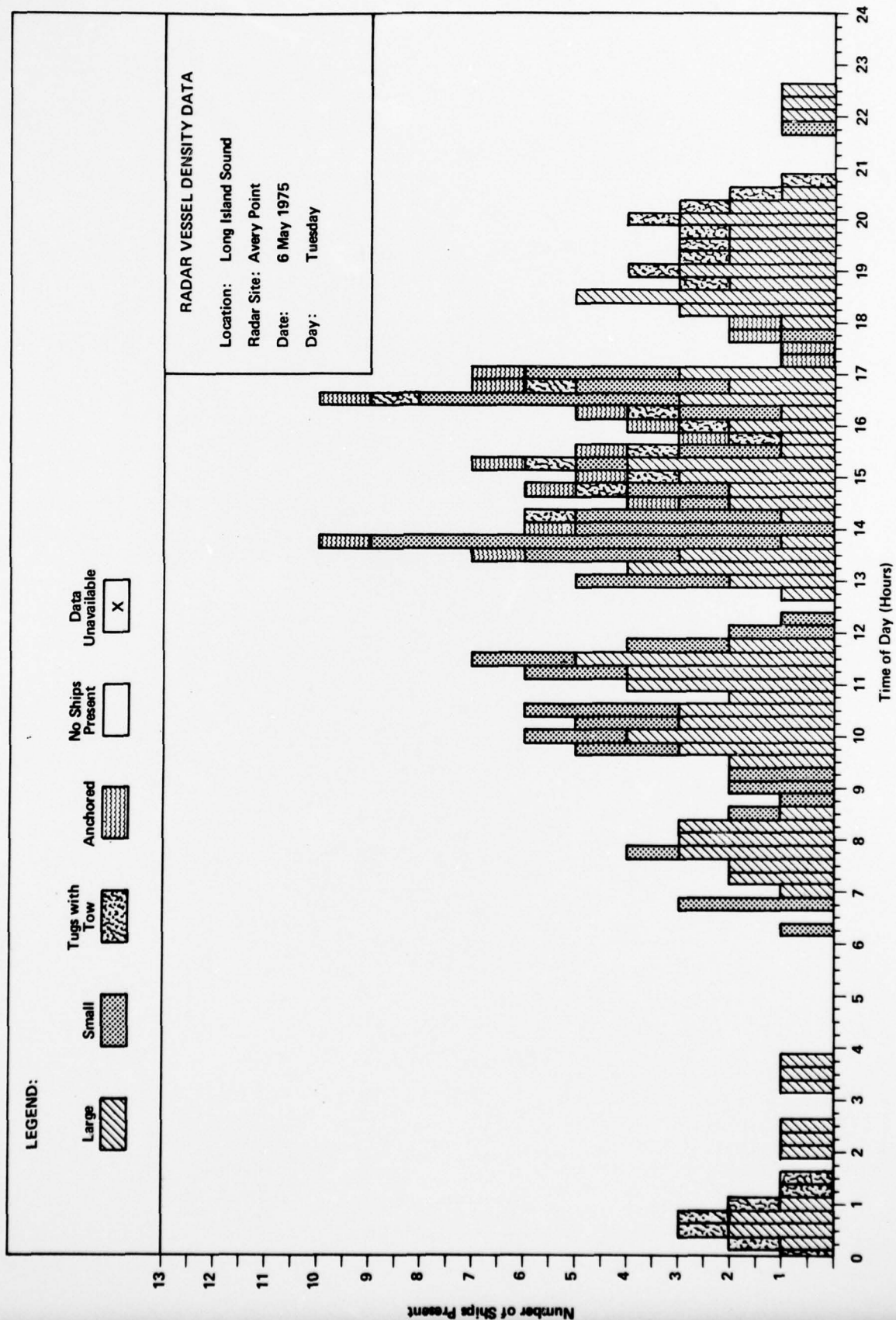


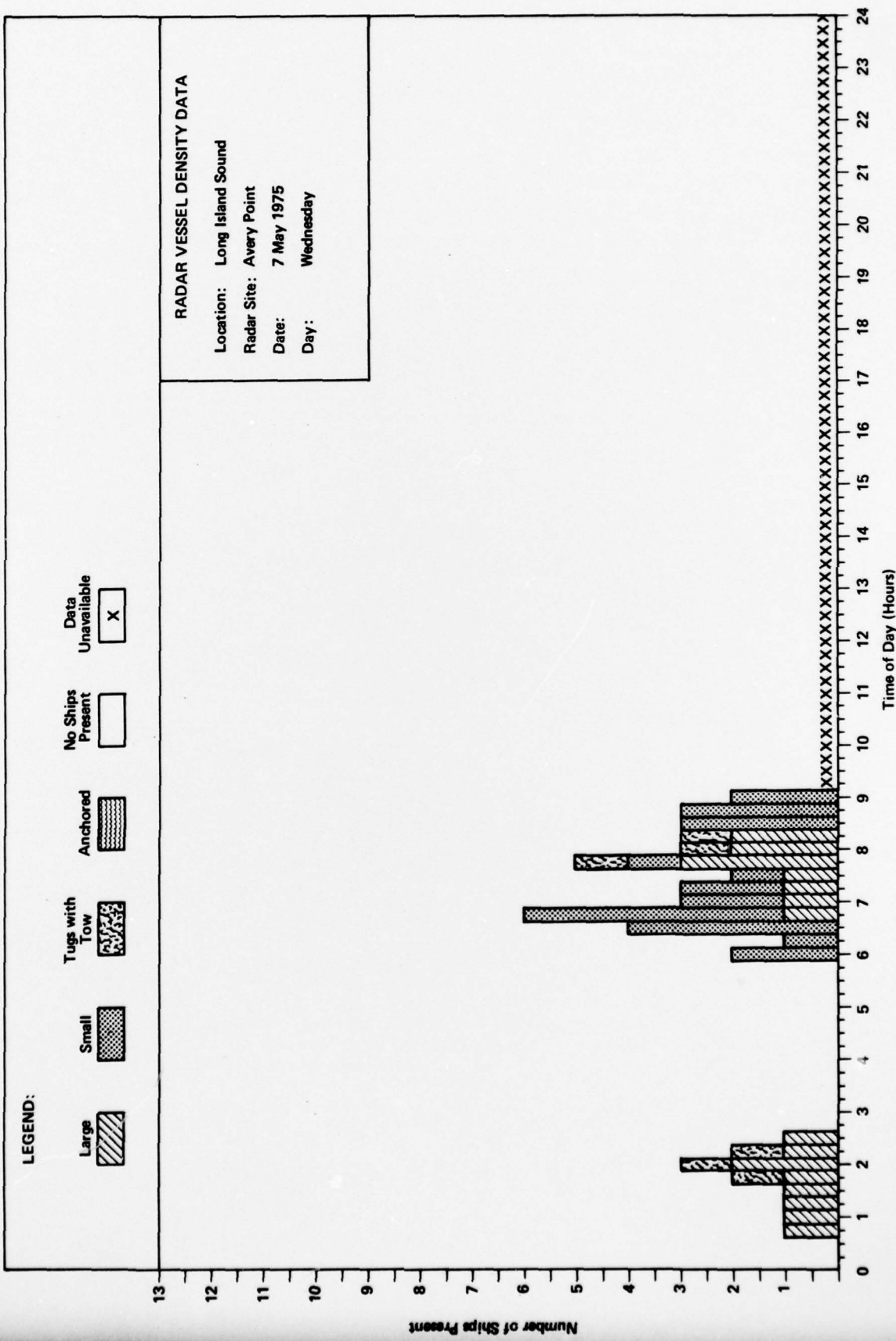


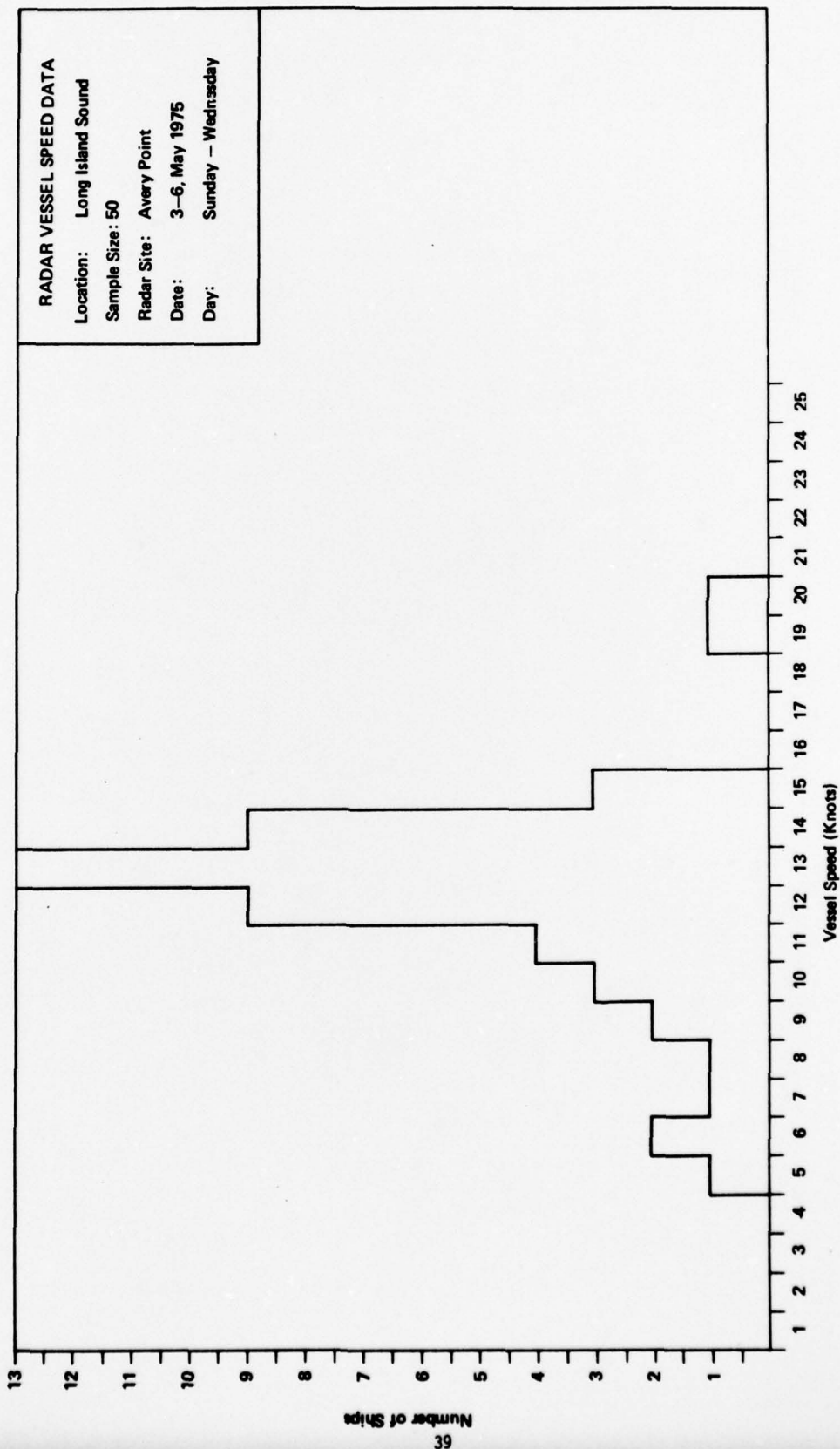










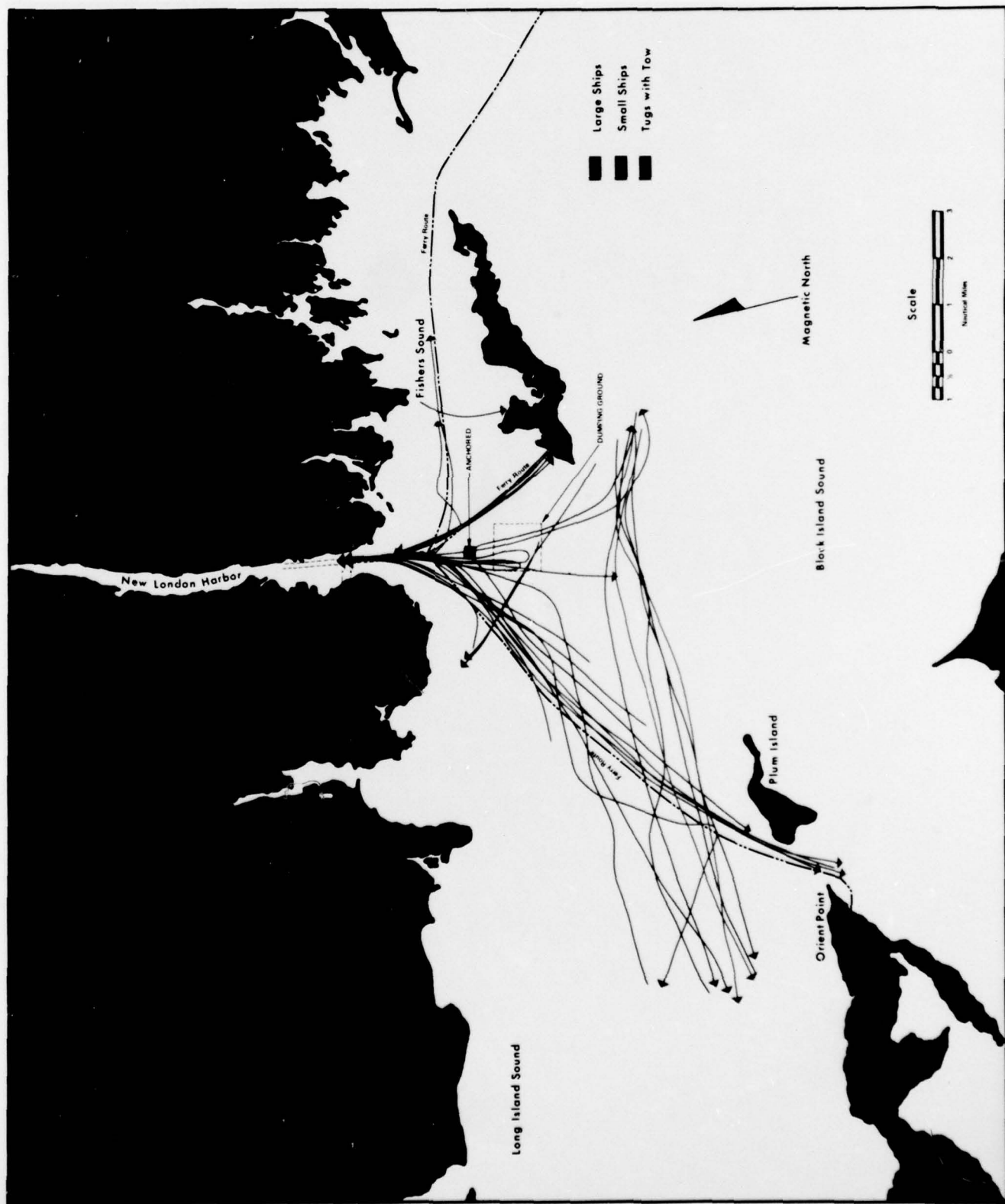


SPEED DATA
FOR
AVERY POINT


Vessel No.	Vessel Size	Average Speed in Knots	Direction	Day	Time Hour/Minute	
1	small	13	SW	Sunday 3 May 1975	14	43
2	small	11	NE		16	38
3	small	14	SW		16	51
4	large	13	SW		18	13
5	small	11	NE		18	46
6	large	9	E	Sunday 3 May 1975	19	38
7	large	12	NE		19	58
8	large	13	W		21	24
9	large	15	W		02	21
10	large	14	SE		05	32
11	large	13	E	Monday 4 May 1975	06	25
12	large	13	SW		07	53
13	large	12	SW		09	54
14	large	13	SW		11	24
15	large	9	SE		12	15
16	large	14	NE	Monday 4 May 1975	13	57
17	large	13	SW		14	51
18	large	10	NE		16	17
19	large	14	SW		16	44
20	large	14	SW		18	10
21	large	11	NE	Tuesday 5 May 1975	18	26
22	large	11	SE		21	48
23	large	10	W		21	48
24	large	19	E		00	18
25	large	20	E		00	25
26	large	7	E	Tuesday 5 May 1975	07	06
27	large	12	E		07	42

SPEED DATA
FOR
AVERY POINT (Cont'd)

Vessel No.	Vessel Size	Average Speed in Knots	Direction	Day	Time Hour/Minute	
28	large	13	SW	Tuesday 5 May 1975 ↑ ↓	08	00
29	small	13	SW		09	45
30	large	6	W		10	14
31	small	5	SW		10	23
32	large	12	SW		11	03
33	large	12	E		11	04
34	large	13	NE		13	04
35	large	13	SW		14	43
36	tug with tow	10	W		15	04
37	large	12	W		15	35
38	tug with tow	12	W		16	14
39	large	14	SW		16	43
40	large	13	SW		18	02
41	large	14	W		18	50
42	large	8	E		18	50
43	tug with tow	6	E	Tuesday 5 May 1975 Wednesday 6 May 1975 ↑ ↓ Wednesday 6 May 1975	19	08
44	large	12	NE		19	45
45	large	14	W		19	57
46	large	15	E		00	35
47	large	15	W		01	42
48	large	13	W		02	13
49	large	12	W		07	05
50	large	14	W		07	40



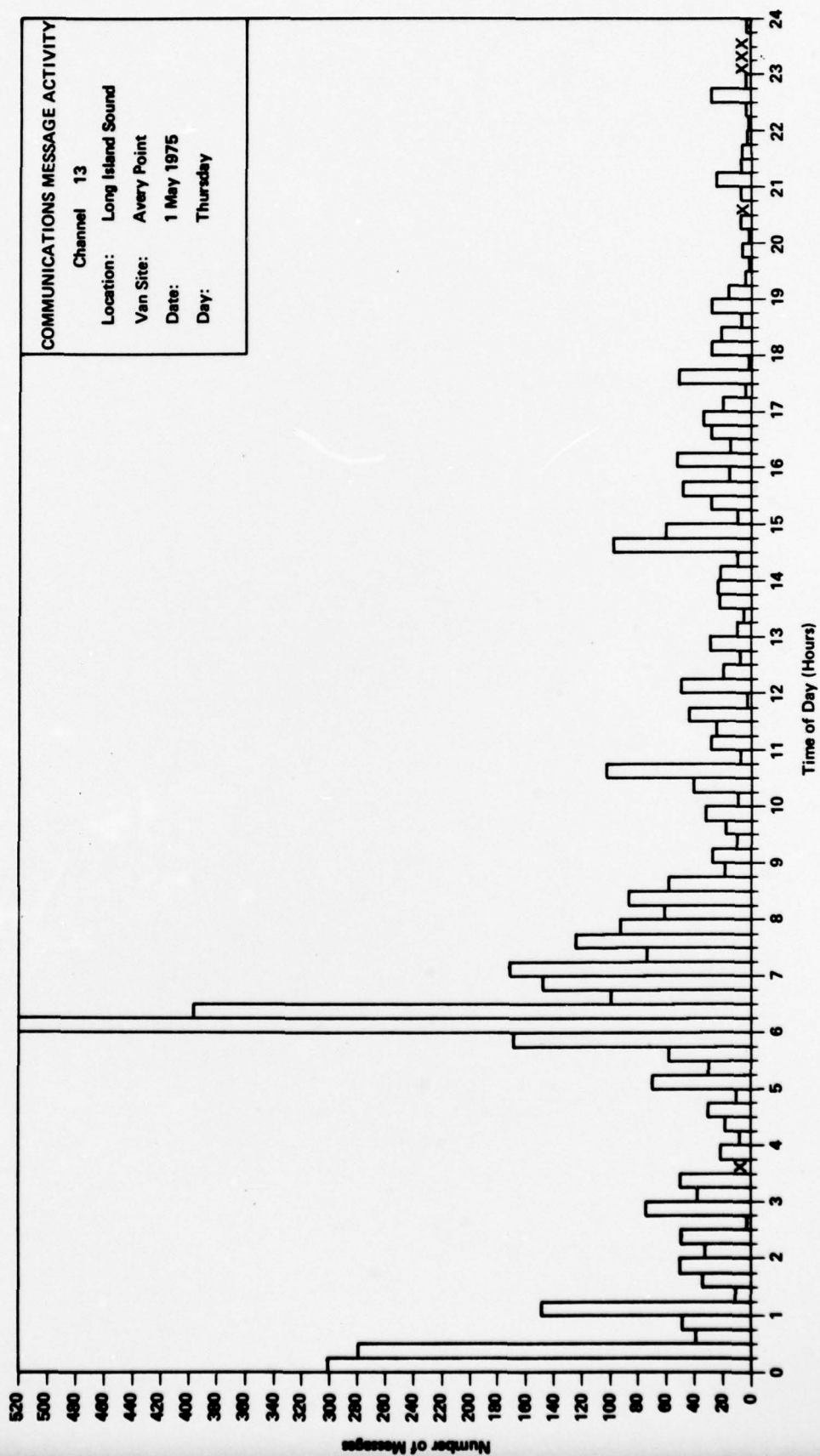
CLOSE ENCOUNTER
FOR
AVERY POINT

No.	Day	Time Hour/Minute		Distance Yards	Size	Manner of Approach*
1	Saturday 3 May 1975 	06	44	250	2 small	O
2		07	33	400	2 large	P
3		07	40	280	1 large, 1 small	P
4		09	12	<110	2 large	P
5		09	20	190	2 large	P
6		09	38	200	2 large	P
7		10	06	<100	2 large	O
8		12	55	<90	1 large, 1 small	P
9		13	33	320	2 large	O
10		13	46	190	2 small	P
11		13	47	290	2 small	P
12		13	51	100	2 small	O
13		14	41	200	2 small	P
14		14	42	250	2 small	P
15		14	47	300	2 small	P
16		14	51	<80	2 small	P
17		14	51	<70	2 small	P
18		14	58	380	2 small	P
19		15	25	200	1 large, 1 small	P
20		15	48	<100	2 small	P
21		17	07	250	2 large	O
22	Saturday 3 May 1975	18	00	30	2 small	P
23		20	16	100	1 large, 1 small	P

23 close encounters out of 49 encounters in 24 hours.

*P = Passing
O = Overtaking
C = Crossing

< = less than



X = No Messages

COMMUNICATIONS CHANNEL
UTILIZATION

Channel 13

Location: Long Island Sound

Van Site: Avery Point

Date: 1 May 1975

Day: Thursday

